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RECONSTRUCTION OF SPOKANE INCINERATOR

Three Forty-Ton Units Moved to a New Site, and New Modern Stable, Repair Shop, Garage and Other Buildings Constructed—Method of Raising Funds for New Buildings.

By ARTHUR E. PETERSON.*

VIEW OF INCINERATOR GROUP FROM THE SOUTHEAST.
Incinerator in foreground, office and shop at rear of incinerator.

Note: The Spokane incinerator, its operation, and the collection of refuse by the city were described by Mr. Peterson in an article that appeared in the issue of Municipal Journal for February 13th, 1913. The incinerator consisted of three 40-ton units built in 1908. This incinerator has now been moved to a new site, as described below.

Waste disposal by incineration has been resumed recently in Spokane. The crematory plant was closed down for practically three months during the erection of new buildings and renovation of the furnaces. The original sheet steel crematory building has been completely dismantled and the new structures of steel, concrete and brick have been completed.

During the shutdown the furnaces were removed to the new crematory building and overhauled. The work of modernizing the furnaces was done by the Decarie Incinerator Company of Minneapolis, which made the original installation. The interior arrangement of the furnaces has been altered in accordance with the latest practice of the company. It has been demonstrated in the tests made that the efficiency of the furnaces has been greatly increased. Both our labor and fuel costs have been reduced. We have not had occasion to charge the furnaces to their maximum, therefore we are unable to indicate what will be the minimum cost per ton for disposal.

The building in which the furnaces are housed contains modern toilet, shower and locker facilities. It is well lighted, having an ample number of windows of large size. There is an entire absence of obnoxious odors in or about the building. The walls and floors are waterproofed, therefore the entire building may be cleansed by flushing whenever necessary.

The three furnaces were formerly set in line lengthwise of the old building. This occasioned a loss of time in unloading trucks, because of the fact that we were unable to unload in the middle furnace when unloading into the furnaces on each end. We have in the new plant offset the middle furnace about six feet. With this arrangement we may unload into all furnaces at the same time without interfering with the movement of wagons or trucks on the same unloading floor.

The horses used in waste collection work have been removed from an old wind-racked frame barn to a modern brick stable. The stable contains a lounging and locker room, and is completely equipped with toilet and lavatory and heating system. The upper portion of the stable is utilized as sleeping quarters for the stable attendant, and for storage. The stabling quarters have stalls for eighteen horses and a box stall. The stable is well lighted and ventilated. The concrete water troughs have hot and cold water available. The concrete floor and the walls are waterproofed. The floor is pitched to four catch-basins. The stalls have false floors of wood, all the boards of which are spaced one-half-inch apart for drainage. The floors are hinged so that they may be

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*Superintendent of Crematory Division, Dept. of Public Affairs, Spokane, Wash.

OFFICE AND INCINERATOR BUILDING.

raised and thoroughly flushed at regular intervals. The wood floor is pitched only one inch to ten feet, which allows the animals to assume a practically natural position while standing in the stalls and eliminates the many results of constant strain of standing on a floor which has too great a pitch. To obtain proper drainage in the stalls, the concrete floor has a pitch to the gutter of three inches to ten feet. The partitions between the stalls are built of two by six-inch material with a two-inch space between boards, by which means we secure a free movement of air throughout the stable room. The horses face each other with a four foot alley between. The ceiling is ten feet high. The stalls are all of large size and the air space allowance is somewhat greater than suggested by most authorities. Since our horses have been well housed we have been able to reduce their feed ration and there has been a general improvement in the health of the animals. When we find that we can use additional autos in our work the stable may be converted into a garage with a nominal expense.

The stable building is rectangular, 62 ft. 2 in. by 42 ft. 2 in. outside dimensions. The lockers and toilets extend across one end of the ground floor, all the rest being in one large room 50 by 40 ft. A 4-ft. passage or alley runs lengthwise of this through the middle, and a cross passage 5 ft. wide crosses it 20 ft. from one end. On each side of the alley are nine stalls with their mangers next to the alley, each stall being 5 ft. wide center to center of partitions and 10 ft. long over all. Along each side of the building is a passage 8 ft. wide between the outside wall and the rears of the stalls. Two 8-ft. doors in the outer wall open onto each passage. In each passage, against the wall, is a concrete water trough 8 ft. long by 18 in. wide. In the alley are two grain boxes with hinged lids, connected with the bin by a 6 by 6-inch chute.

In each side wall are two 3 ft. 8 in. windows lighting the stable and one 3-ft. window lighting the toilet and locker rooms, and in the end occupied by these rooms are four more 3-ft. windows. The other end wall is blank. Each stall partition consists of a 6 by 6-inch post at each end, slotted to receive the 2-inch partition planks. The floor is concrete throughout, with a false floor of wood as described elsewhere.

The repair shop is a daylight shop, equipped to repair autos and wagons and to do all shoeing necessary. There is room in the shop for two trucks and three horses at one time.

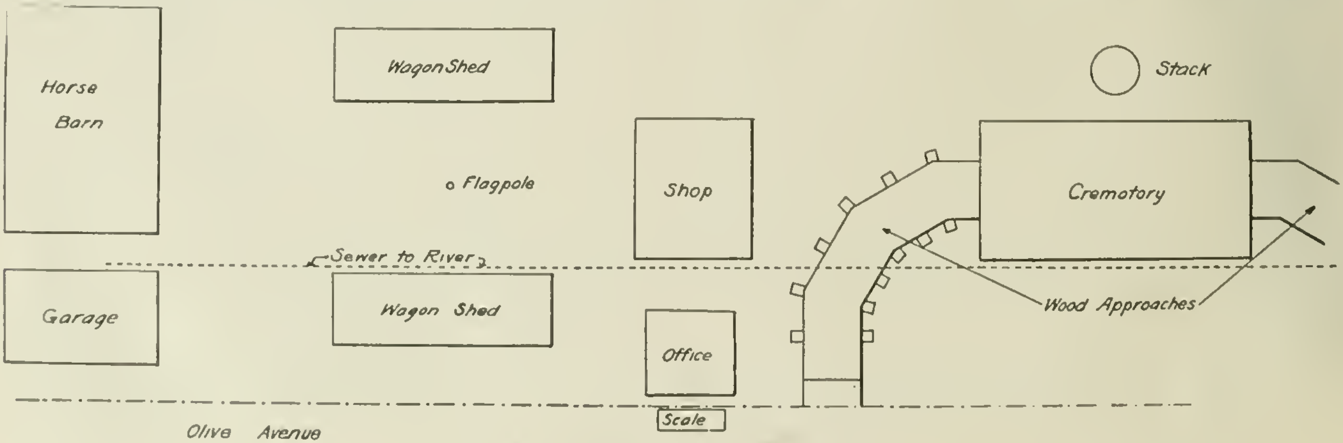
The garage building, which is waterproofed, has an overhead water system, a heating system connected with the stable system, and a catch-basin in the centre of the floor.

The office building, which completes the group, is so located that all branches of the crematory work are within easy reach. A fifteen-ton auto scale is set directly in front of office, in the street, with the beam in the office at the elbow of the order clerk. The office has eleven-foot ceilings, large windows and spacious desk room. Hot and cold water, a drinking fountain, lavatory and toilet complete the appointments in the office. The building has a full basement, which is used for stores.

STABLE AND GARAGE IN FOREGROUND, WAGON SHED AT REAR OF GARAGE.
Since this was taken rubbish has been removed and road graded.

Mr. Duncan, superintendent of parks, is working on plans for the parking of the crematory grounds and will supervise the work of beautification in the spring.

The crematory group now consists of five modern buildings of pleasing design and practical arrangement, two wagon sheds of steel and wood construction with



GENERAL LAYOUT OF NEW PLANT.

ace enough for all crematory equipment, and a 207-foot ck of Weber conical design. The Spokane waste col-tion and disposal equipment will now compare very orably with that of any municipality in the United ates and the total cost to the city for the improvement s been a little less than $5,000.

The manner in which the funds necessary were secured o erect the buildings will form an interesting paragraph n the municipal history of Spokane. A local railroad ompany owns land which completely surrounds the rematory property. This land is distinctly yard prop-rty, therefore the crematory nestling in their centre did not enhance the value of their holdings. A swap was suggested. Terms were agreed upon and a trade made. Under the terms of the deal the city turned over to the railroad its crematory site and received in return an equal amount of land, slightly nearer to the centre of the city, a thirty-foot roadway extending for almost one half mile and a moving bonus of $30,000. Of this amount $5,000 was turned over to the asphalt division toward the expense of moving and remodelling the asphalt plant. The balance has been used in the completion of the crematory group. When the proposition of moving was originally decided upon it was planned to utilize some of the old buildings used in the crematory work. After the improvements planned were well begun the incongruity of the old tumble-down buildings—which were a civic disgrace—grouped with the modern brick structures was readily apparent. Therefore the old buildings were all razed and the complete set of new buildings has been erected. This entailed an additional expense of $5,000, which was met by the city.

NOTES ON BRICK PAVING

Outfits and Methods Used in Constructing Monolithic and Sand Cushion Pavements—Applying Asphalt Filler to Close Joints.

The following notes regarding methods of constructing brick pavements as used by various contractors and engineers were gathered from observations made during the past season. Some of them give valuable pointers and some of them tend to show why perfect brick pavements are not always seen.

A MONOLITHIC BRICK PAVEMENT.

The first photograph shows the layout for constructing a street in a city under the three-mile road law of Indiana, the work being done by the county and paid for by the issue of bonds of the township in which the city is located. The pavement is 20 feet wide on each side of the single street railway track in the center. The pavement on one side of this track was completed before the other was begun.

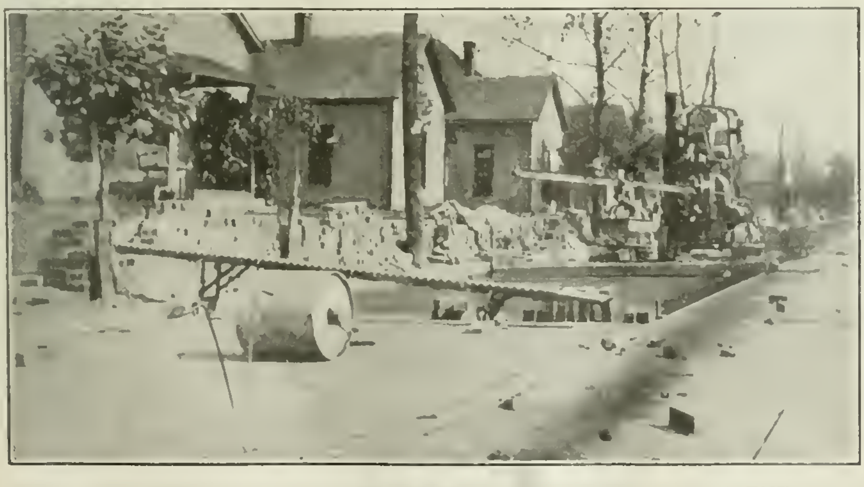
The machinery used included a road grader for shaping the subgrade between the curb and the street railway track, the pavement being laid without break from curb to rail; an Erie roller for compacting the subgrade; the Koehring mixer seen in the photograph; a home-made box drag for shaping and compacting the fine gravel (seen in the second photograph), which was drawn forward by the ropes shown; a form for smoothing off the surface for laying brick, seen in the same photograph alongside the box concrete shaper; a Mathews gravity carrier, and a hand roller for rolling brick.

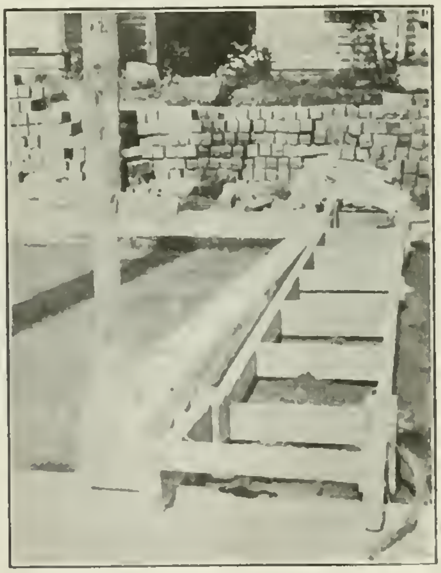
Concete curb, half-inch Elastite joint along the curb and a nearly plane surface with cross slope enough for drainage are according to standard.

The most noticeable departure from standard practice was the concrete. This was made of a very fine gravel, largely coarse sand, which was obtained from an excavation on some vacant lots alongside the street, so that delivery as well as material was secured at the lowest possible cost for wagon haul and hand shoveling. The concrete was deposited presumably 5 inches thick (but not very accurately so) by the mixer's traveling bucket, some of it being deposited in the boxes of the shaper so that all depressions in the surface should be filled. The surface was further compacted by the straight-edge or form mentioned and is smoothed off still more by hand luting when necessary.

On this smooth surface of the concrete the bricks were laid and after inspecting, turning and replacing rejected brick, and rolling, the cement grout filler was applied. The concrete was so fine-grained and its finished surface so smooth that the usual dry cement-and-sand layer was not required.

One question that arose was as to the strength of concrete which is so nearly a cement mortar, although the proportions seemed to be such as to produce a dense concrete which hardened into a compact mass. Another question was as to the sufficiency of the cement grout to produce a monolithic pavement. The sand for this grout was produced by sifting the gravel in the pit through a


OUTFIT FOR LAYING MONOLITHIC BRICK PAVEMENT.
Road grader, heavy roller, hand roller, concrete mixer, smoothing form, and gravity carrier.


BOX DRAG FOR SHAPING AND COMPACTING CONCRETE.
Also form for smoothing surface for laying brick.

vertical wire screen with long spaces between the stretched wires by throwing the fine material against it. There was so much dirt in the resulting sand that each batch of grout as dumped from the box showed several lumps of mud rolling over the surface of the bricks and the grout was dumped from the box in one mass without shoveling or distributing except as the water in the mass carried the cement, sand and mud over the surface or into the joints.

Wire-cut lug bricks were used, but this method of grouting will probably not give them their full value in the pavement. The gravity carrier carried bricks to the outer side of the pavement, where they were laid in piles by a couple of boys. The piles near the gutter were made by men handling the bricks directly from the large piles along the curb to the small piles in threes along the edge of the laid bricks. Little care was taken to lay the lugs in the piles uniformly in the same direction and not much more care in laying them straight in the pavement. The Brazil blocks used were very uniform and smooth and almost all the turning of bricks in the inspection was for the purpose of putting the lugs on the right side. Even then, perhaps ten per cent of the bricks still had the lugs on the wrong side. It is so easy to lay the lugs on the right side that there is little excuse for this waste of time and for the remaining defects. However, the contracting firm doing the work seems to be successful and has a large amount of work each season which is acceptable to the engineers and commissioners in charge.

A STANDARD BRICK STREET.

In Muncie, Indiana, a three-mile road contract for brick pavement was let under the standard specification for cement grout filler and 2-inch sand cushion. The concrete specification calls for 1 cement, 3 sand, and 5 broken stone, but the sand used is practically the same as that used for the whole concrete job just described, so that the proportions actually used are 1 of cement, 4 of the gravelly sand and 4 of the broken stone. There is a 2-foot gutter (combined curb and gutter) and a ¾-inch Elastite expansion joint along each curb, the pavement being about 40 feet wide with no car track.

The contractors, W. M. Burch & Co., are quite well supplied with machinery. A Thew automatic shovel takes out the grade almost exactly to cross section and the grade is finished with a Champion finishing grader, horse drawn. A Koehring self-propelling gasoline concrete mixer places the foundation. Two Mathews gravity carriers transfer the bricks from curb piles to street, one working from each curb, and the bricks are piled so as to make it easy to lay the wire-cut lugs all on the same side. A large horse roller is used on the sub-grade and a small hand roller on the brick surface. A Rex chain-belt grout mixer drops the mixed grout into the joints in the best manner possible.

As has happened frequently this summer, largely on account of difficulties in transportation, several kinds of bricks have been used on the contract and those latest received were very irregular in shape and many of them were marked for turning, with a rather large proportion of rejections. This is one of the difficulties peculiar to seasons like the present, which under ordinary conditions it is easy to prevent.

APPLYING ASPHALT FILLER.

On contracts in Bloomington, Ill., the difficulty with delivery of brick was so great that, although repressed blocks with points for lugs were specified, the contracts were finished, after two changes during the season, with plain Springfield wire-cut blocks. The question with these blocks was as to the possibility of filling the narrow joints between the blocks, as laid close together, with the specified asphalt filler. The city engineer, E. H. Packard, after some experiments, decided that it could be done using the Warren apparatus for applying the seal co to bitulithic pavements. This consists of a wheeled b with a plugged hole in one corner and a curved rubb squeegee which draws over the pavement the asphalt out of the hole ahead of it, the concave curve concen trating the asphalt rather than distributing it. Th bricks were so smooth and so smoothly laid that a ver thin skim of the asphalt was left on the surface and th asphalt was heated so hot and applied so rapidly that thoroughly filled the joints from top to bottom.

The experiments showed that the asphalt, when ho enough, ran several inches either way from the point o application and that there was no difficulty in securing complete filling. Time studies showed that a bucketfu of hot asphalt, about three gallons, would be applied i about 5½ minutes when poured by hand from cans into the joints, accompanied by considerable spilling over and requiring the squeegee over the surface; while the same amount would be applied by the Warren machine in 35 seconds and less would remain on the surface, especially in cold weather, as the 5½ minutes and the squeegee give so much more opportunity for cooling of the asphalt and consequent stoppage of flow.

Contractor I. D. Lain used the following method in handling bricks directly from car to street on a late contract for a single block, which had been held up by non-delivery of brick and was all ready for the brick som time before they arrived. The bricks were racked on wagons without sides and with bottoms sloping slightly toward the center so that, with the end gates, the bricks did not fall off in transit. These wagons were hauled over a wooden track laid on top of the newly laid brick nearly to the edge, when the horses were unhitched and the wagon pushed up to the edge by hand. Two men in front piled bricks for laying the middle of the street, two men on each side loaded gravity brick carriers which carried the bricks to the quarters, where two men for each carrier took them off and piled them for the layers. One extra man, 2 layers, one man to look after the extra wagon, water boy and foreman and 3 men spreading sand ahead of the laying completed the gang.

Presumably the wagon would be rolled back on the board tracks before the new wagon was driven in, but the unloaders were idle during much of this process, so it was very easy to run the empty wagon to one side so that the team unhitched from the loaded wagon could be turned round to the unloaded wagon, hitched up and driven off over the bricks. This doubtless left the surface somewhat uneven, although it was thoroughly rolled before filling. One result of this was a little more asphalt spread on the surface to fill the low spots partially.

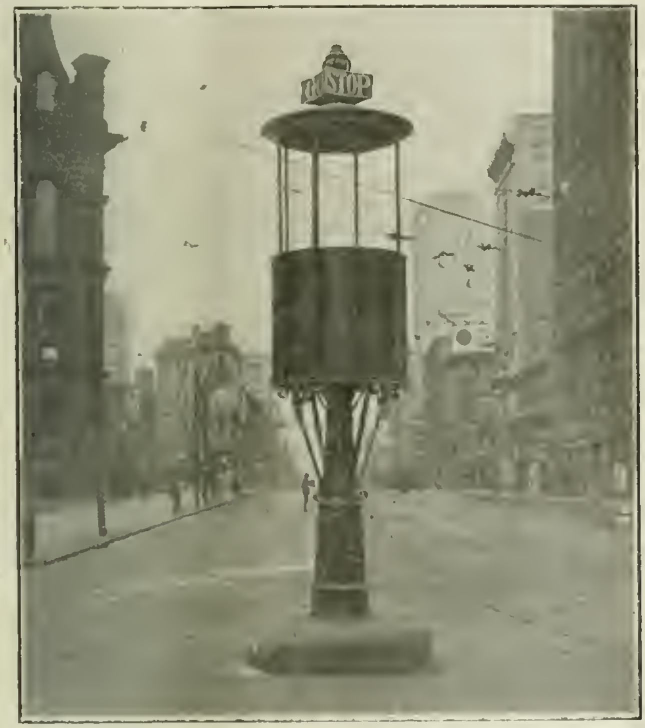
The boards for the wagon tracks were bound at each end with a wide strip of galvanized iron so that they would not split under the heavily loaded wagon wheels Enough boards were used for the double length of the block.

CROW'S NEST TRAFFIC SIGNAL.

A traffic count made recently by the Detroit Police Department at the point shown in the illustration, where six streets converge, gave about 20,000 as the number of vehicles that cross this intersection in ten hours. It is claimed that in no other American city, not even in New York, is there an intersection where the amount of traffic exceeds this.

At this point the city has erected an elevated box for the traffic officer. This signal box raises the traffic officer out of danger from the traffic and also gives him a more extensive view, thus enabling him to control the traffic to better advantage. Also, from this box he signals eight other traffic officers stationed within a few hundred feet out the converging streets.

The base of the tower is of concrete and the superstructure of steel. The box or "crow's nest" is round and elevated 6 feet above the ground. Above it, and operated in the regular way, are the customary "stop" and "go" signs and the red and green lights used for controlling the movement of traffic.



CROW'S NEST TRAFFIC SIGNAL, DETROIT.

MODERN GRANITE BLOCK PAVEMENTS

Most Satisfactory Materials for Filler and Methods of Mixing and Applying Same—Sand and Sand-Cement Cushions—Shallow Blocks.

In a paper before the American Association for the Advancement of Science, Clarence D. Pollock described the characteristics of the best granite block pavements as now laid. Most of these are familiar to all who have kept informed in paving matters, but some of the later developments in filler and cushion practices may be noted.

Cement grout filler is preferred if traffic can be kept off the new pavement a long enough time to permit it to set thoroughly. This should be mixed one part Portland cement to one part of even-grained, fine sand—one that will pass a 20-mesh sieve if this is not too expensive. The finer and more even the sand particles, the better they will remain in suspension and the more uniform the filler. Machine mixing is advised.

If a bituminous filler is used, the best practice is to mix a fine, hot sand with it before pouring, between 70 per cent and 100 per cent (by volume) as much sand as bitumen being used. A straight coal tar pitch is too susceptible to temperature changes to be used in this climate, but a mixture of one part asphalt with five parts of coal tar pitch gives good results, as does asphalt alone. The hot sand and bituminous material should be mixed and at once drawn off into wheelbarrows or the like, dumped at once upon the pavement and worked into the joints until they are thoroughly filled. When the filler stands up flush with the surface of the blocks, a small amount of sand should be spread over the surface, which will prevent the tar adhering to wheels and help to harden the surface of the filler. Brooklyn, N. Y., uses one part refined residual asphalt to five parts coal tar pitch, and Manhattan borough uses asphalt cement; not to exceed one part of sand being added to one part of the bitumen in each case. The mixing is done with a rake or a perforated hoe.

The cushion may be sand not more than one inch thick, or a dry mixture of one part cement to four of sand. The latter costs about 15 cents per square yard more, but is probably advisable where the traffic warrants it. It does not seem advisable to use the cement when bituminous filler is used, for in the latter case the cement can not set until after traffic is allowed on the pavement and so fails to bind the blocks to the foundation. It is claimed that the cement prevents the cushion from washing if water finds its way into it, but if the joint filler be properly placed there will be no danger of such washing occurring.

Concerning the use of blocks shallower than 5 inches, Mr. Pollock says:

"It is sometimes necessary, because of freight charges, etc., to use shallow blocks, or else use a pavement which is less durable than granite blocks. This condition is more likely to prevail on road work and in inland cities where there is a rail haul.

"Then there is another condition which requires a shallow block, and that is where the traffic conditions have changed so much that it is necessary to use granite to replace a lighter material, and yet it is desired to utilize the old concrete foundation. For such a condition a resurfacing block is made which has a depth of 3½ to 4 inches. It is preferable to lay such a block upon a cement mortar cushion, especially if the traffic is heavy."

STREET PARKING OF AUTOMOBILES.

In the streets of Phoenix, Arizona, the congestion and other objectionable features caused by motor cars standing along the curb for hours at a time finally led to the adoption of the present parking system. By this system, instead of allowing cars to park at the curb, where they interfered with traffic and kept the store entrances crowded, the city manager directed that parking places be outlined in the middle of certain streets where there are no car tracks to interfere. Broad bands of white paint marked off standing room for the automobiles, and each machine was required to line up inside one of the squares so designated if it was to be left for more than twenty minutes in the street.

PARKING CARS IN CENTER OF STREET.

Ample room is provided for running the cars in and out, and backing is not permitted. To take care of the machines for hire, spaces at each corner are reserved and each driver has his own stand.

Double lines of cars facing with the traffic are found on the narrower streets, but on the wider thoroughfares the machines are parked at right angles to the traffic.

This system has been tested long enough to prove that it is a success. The traffic lanes are kept open and are separated by the lines of standing cars; the curbs are not encumbered with idle machines, though alighting at the curb is permitted, and the merchants are satisfied because the way to their stores is always open. Either shoppers or delivery men can always approach the places of business, which in the past were usually blockaded by standing machines.

UTILIZING WASTE IN LIVERPOOL

Garbage Cooked and Fed to Pigs and Poultry—Bones, Antique Eggs, Banana Stalks, Fish, Oyster Shells, Straw and Other Wastes Utilized.

In a paper read last October before the Institute of Cleansing Superintendents in England, John J. Beckett, superintendent of cleansing of Liverpool, describes some of the new practices of that city in the collecting and disposing of the city's refuse, and especially the waste food.

In addition to the markets and other sources of animal and vegetable waste matters, Liverpool contains large numbers of cold-storage and warehouses where are received and temporarily stored food received from over seas, chiefly from America. Owing to delays and other causes, more or less of this is received in a stale or damaged condition and has to be disposed of. In the general effort to eliminate all waste during the war, it was decided to make special efforts to put this food matter to some use. A special and separate collection from all retail fish and greengrocers' shops was inaugurated, and all house-holders were urged to separate their garbage from the other refuse (which has not been the practice in England), the city supplying for receiving the domestic garbage small tin cans in which oil is sent to that country from abroad. Thousands of these empty cans were obtained by the city authorities and cleaned and painted, their total cost being less than 25c.

At the suggestion of the city engineer, John A. Brodie, experiments were made in preparing and cooking the material, the product to be used for feeding pigs and poultry; utilizing for this purpose some old pitch boilers that were available and using the steam from the refuse destructors for heating and driving the machinery. Abattoir offal and household garbage were boiled in these and, when thoroughly cooked, the product was taken while hot by motor wagons to the corporation's piggeries, where about 200 pigs and a large amount of poultry on the corporation's farms have been regularly fed with this material for twelve months.

The following is a short description of some of the materials which gradually came to be prepared after experimenting for some litttle time on a small scale:

Bone Meal.—All bones are collected, washed, boiled, fat extracted, and ground.

Egg Meal.—Damaged eggs are frequently received in large numbers. One consignment dealt with a few weeks ago reached a quarter of a million. These eggs are boiled, chopped, dried, and ground into meal, forming an excellent chicken food.

Ash Fertilizer.—A small furnace has been erected to burn all light material, such as soiled paper and straw, old wooden boxes, etc., the resultant ash being a fertilizer containing about 12 per cent of potash.

Dried Vegetables.—Cabbage leaves, of which we receive large quantities, have been dried and stored, and found very useful as a poultry food.

Banana Stalks.—In the early days of the war large quantities of these stalks were being removed by us, and after experimenting we found that by scientific treatment a considerable quantity of potash could be obtained and used for soap-making purposes.

Fish Fertilizer.—Where the fish is found to be in a bad condition it is immediately made into fertilizer by drying quickly at great heat.

Charcoal.—All old wood refuse heated at a low temperature to permit of carbonisation.

Oyster Shells.—Washed, calcined and ground, find ready sale to poultry feeders.

Chopped Straw.—All clean straw from packing, etc., is gathered and chopped and sold as a very good scratching material for poultry sheds.

From the experience already gained there can be no doubt that work in this direction has been attended with very beneficial results, particularly in assisting to raise poultry in the production of eggs and in the feeding of pigs and rabbits for slaughter.

This experiment was so successful that a regular reduction plant was installed, which Mr. Beckett described at some length, this type of plant being novel in England. In brief, it consisted of a digester, a drier, a vacuum pump for removing objectionable gases, a disintegrator, and skimming tank for removing fats. Steam was used in cooking. The amount of greases and tankage recovered was not stated. Heretofore it has been considered that English garbage contained too little grease or other waste food materials to make it profitable to endeavor to recover them in this way, and it is to be presumed that during the war the garbage is even less rich than formerly. The grease is sold at "an exceptionally high price," and the tankage is used for poultry food in proportion of 10 per cent of the whole food and is sold at $75 or $80 a ton. Apparently meat and fish are digested separately, for the author states that, making a comparison on a basis of percentage of albuminoids and phosphates, the meat meal has a value 2½ times as great as barley meal, while the fish meal is nearly twice as rich as barley.

In addition, the city has found that, by keeping the garbage out of the ashes and other refuse, the latter can be sorted and picked over to better advantage and the city is now recovering from the dry refuse a considerable quantity of waste paper, rags, string, old bagging, bottles, glass, tin, galvanized iron and enamelware.

WOOD BLOCK PAVING IN BALTIMORE

Methods and Care Used Prevent Bulging—Tar or Asphaltic Filler—Sand Used for Lug Block Joints.

Although wood block paving is not extensively used in Baltimore, Md., there are several streets so paved. Nearly all of these contain street car tracks. Conduit and manhole covers in the street surfaces are of various shapes, including circular and octagonal, the latter of which are not easy to fit block pavements to, but wood blocks can probably be adjusted to them more readily than any other kind of block.

Very little trouble is reported from the bulging of wood block pavements in Baltimore, which is probably due largely to the methods and care employed in laying them. The specifications provide that the same kind of timber shall be used throughout each contract, a list of acceptable timbers being given, although yellow pine is that most commonly used. Yellow pine blocks must have not less than 50 per cent heart wood and must average 80 per cent, and there must be an average of at least 6 annual rings to the inch, radial measurement, no block containing less than 4. Blocks must not vary more than ⅛ inch in depth or 1/16 inch in width. They are treated with 18 lbs. per cubic foot of a coal tar product free from adulteration, of 1.08 to 1.14 specific gravity, and must show satisfactory penetration. On most of the streets laid so far, plain rectangular blocks have been used, set loosely together on a sand-cement bed, with joints not exceeding ⅛ inch. An exception is German street, constructed in 1915, which contains two car tracks, although the roadway is not more than 35 feet wide. This was laid with Kreolite lug wood blocks, laid as closely as the lugs permit. The two lugs on one side of each block are somewhat circular in form and the one lug on one end of each block is nearly triangular; all lugs being about ⅛ inch high and ¼ across the base.

For filling the joints, the specifications usually provide for a tar or asphaltic filler. For the lug wood block pavement the specifications provided that, after the blocks had been thoroughly rolled, enough fine, hot and dry sand should be spread on the surface and swept into the joints to fill the spaces between the blocks for a depth of about 2½ inches, all sand to be broomed out of joints to a depth of at least ½ inch below the surface. The joints were then squeegeed full of an asphaltic filler containing 99 per cent pure bitumen, 13 penetration at 32° Fahrenheit, 250 at 115°, and 40 to 66 at 77°; with a ductility of 20 cm. or more at 77°. It was provided that the filler should be thoroughly squeegeed in and the tops of the blocks left clean enough to show the grain or rings of the wood. The surface was then covered with coarse sand.

When observed in hot weather when about two years old, this street showed no indication of undue expansion or bulging, the only trouble reported by the engineer being a slight bulging in the wing of an alley intersection where the pavement had not been properly laid. This was corrected and there has been no trouble since. As stated before, bulging troubles have not been experienced in any of the wood block pavements in Baltimore, except occasional instances as that just referred to.

One reason for the absence of bulging troubles seems to be that the pavement has an almost straight cross-section from the curb to car track, the crown being too slight to cause much tendency of arching of the pavement under the stress of swelling blocks. In laying blocks, it seems to be the custom to lay them when they are their maximum size. When cement filler is to be used, the specifications require that the blocks be kept free from dirt and sand and kept wet for four successive days after rolling before the grout filler is applied. In hot weather, particularly, the streets are flushed by use of Kindling squeegees or are sprinkled and swept at night, and about twice a day the street is sprinkled by a sprinkling car run on the street. There is ordinarily, therefore, little opportunity for the blocks to dry out and the water or oil in them to evaporate..

On the lug-block street the blocks have swollen somewhat lengthwise of the blocks (crosswise of the street) but the lugs have either crushed or indented the adjoining blocks so that any motion due to swelling has been confined to the depth of these lugs in each joint. The swelling of individual blocks lengthwise of the street is not so great as that crosswise, because the width is only one-half or one-third the length of the block and there are two or three times as many joints to take up this swelling. The sand in the lower part of the joint is practically incompressible, so that at the bottom the joints probably are not reduced in width; but there is frequently evidence of some compression of the joint filler and also of the lugs at the top, or rather of indentation of the adjoining blocks by the lugs. (This relative incompressibility of the bottom of the joint probably assists greatly in preventing the lifting or bulging of the blocks.)

The hot sun seemed to expand the filler somewhat so that it projected slightly from the joints that had been exposed to the sun. This projection was sometimes high enough to cause the filler material to be spread over the top of the blocks. This effect was observed on both the side and end joints. There was a considerable amount of bituminous material on the top of the pavement, even where the traffic was heaviest, outside the line where automobiles were allowed to stand along the curb. This indicated either that a considerable amount of bitumen had been left on the street when it was built or that the expansion of the filler by heat and its subsequent spreading over the surface is still continuing. There was no evidence of bleeding of the blocks and the asphaltic filler gave no trouble from sticking to tires or shoes, even when bubbles of air expanded and, when they were burst by pressure, threw drops of clear bitumen out onto the surface.

MUNICIPAL ENGINEERING AND THE WAR

Experiences of English Cities at the Beginning of the War—Road Wear Intensified—Sewerage and Water Supply.

One of the most prominent of England's municipal engineers, H. Percy Boulnois, a few weeks ago delivered a lecture before municipal engineering students in which he discussed at some length the effect of the war on municipal engineering and public health. After calling attention to the extent to which all cities depend upon municipal engineers for roadways well maintained, clean and lighted, abundance of pure water, removal of sewage and other waste products, the supply of gas, electricity, parks, public baths and numerous other conveniences and pleasures, he referred to the demand after the outbreak of the war for the discontinuance of every expenditure for which there was not some absolute necessity.

This introduced several difficult questions, among them the following: (1) At what stage could the works be closed down so as to leave them in a condition that would not be detrimental to them if left in this state indefinitely? (2) How was the financial position of the contractor to be met with regard to his possible profits if he had been allowed to complete the scheme? (3) Was the contract to be altogether broken, or could some arrangement be made under which the contractor could continue his contract on the resumption of normal times if he so desired? (4) What was the position of the consulting engineer, if there was one, under his agreement with the local authority? (5) Would the closing down of the works have any effect on the question of public health? There were further complications, such as what disposition to make of the contractors' plants and of materials which had been delivered on the works or ordered from the manufacturers.

Shortly afterward another difficulty confronted the municipal engineers, in that at least 600 of them either joined the army or entered national service, many of them in the roads battalion at the front or the sanitary companies either there or at home, throwing additional burdens on those remaining.

One of the most difficult problems was that occasioned by the destruction of the roads because of the enormous increase in motor traffic. "Weights are now being carried on our roads which would not be allowed in times of peace. . . . The difficulty of maintaining the roads has been greatly accentuated by shortage of labor and materials and the increased cost of both. The municipal engineer has been sorely tried, but in most cases he has risen to the occasion and by judicious patching on the stitch-in-time principle, and by the more universal application of tar or a bituminous compound to the surfaces of the ordinary water-bound macadam roads, he has been able to maintain his roads in a fair condition, notwithstanding the above drawbacks. What is to happen to the roads, however, if the war continues much longer is a difficult problem, for when once a road has 'foundered' it is an arduous and costly job to reinstate it.

"With regard to the effect on public health by the stopping of monetary grants for road purposes, there can be little doubt that a bad road is an insanitary road, especially in the case of streets with dwelling houses abutting thereon, as mud and dust are both detrimental to the public health." Street cleaning he considers very necessary to public health, and in this work the employment of women scavengers and the introduction of self-propelled sweepers and scrapers has greatly reduced the necessity for the employment of men and horses. He considers it regrettable that shopkeepers and the general public do not assist in keeping the streets cleaner by exercising more care in the way they dispose of their waste paper and rubbish of all kinds.

One effect of the war has been to greatly increase the value of certain materials that are found in municipal refuse. "The value of such articles as old bottles, glass, paper, rags, tins, iron, coal, and numerous other materials found in house refuse, has gone up by leaps and bounds and consequently the municipal engineer is now considering how these articles may be turned to profitable account instead of being wasted." One small district of 20,000 inhabitants let for $200 a year the right of removing bottles alone from its municipal waste. Edinborough last year sold its waste refuse for $11,000. In view of the existing difficulty in obtaining sufficient fertilizers and the urgent demand for the production of more food products, the saving of fertilizing materials in such wastes is worth serious consideration.

Concerning the effect of the war on sewerage work, Mr. Beckett stated that large camps containing thousands of troops have been established all over the country, and the draining of these and disposing of their sewage has often been a difficult and perplexing problem. In addition to these, the enormous munition and explosive manufacturing plants recently established at various points have introduced into the sewers chemicals that have been found to be extremely detrimental to the sewers themselves and have seriously affected the purification of the sewage at the disposing works. "I should, perhaps, get into trouble with the censor were I to give you the names of these chemicals; suffice it to say that in some cases large quantities of picric acid are discharged into the sewers, and those who know the processes which now successfully deal with sewage purification will realize this changed condition of things and the difficulties with which some municipal engineers have had to contend." There are also numerous manufactories which have enormously increased their output not only of products but also of liquid trade wastes. which by their mere volume have overtaxed the capacity of the sewers and that of the sewage treatment plants.

In addition, the concentration of large bodies of troops and great numbers of men and women employed in munition works has severely taxed the ingenuity of municipal engineers in many localities in order to cope with the increased demand for water. Also the situation of camps and of hastily constructed homes for munition workers has in some cases seriously jeopardized the purity of public water supplies because of the inadequate provision made for sewering the new communities, while the depletion of the municipal staffs has rendered impossible as thorough inspection of the water sheds and the sources of possible pollution as before. Because of this same insufficiency of inspectors, waste of water is increasing. Leaking fixtures are allowed to remain leaking and in these and other ways it is estimated that two-thirds of the present water supply is being wasted. Mr. Beckett states that he has seen it stated that in the United States the waste of water amounts to $25,000,000 a year and possibly much more. "It would be an excellent outcome of the war if the public would assist the municipal engineer and become their own water waste inspectors."

One interesting class of experience which we probably will not undergo in this war is that connected with air raids. Because of these, English municipal engineers have adopted reflectors which throw all of the light from street lamps onto the surface, allowing none to escape directly upward. Another is the necessity for boarding up and shoring up buildings which have been shattered by bombs, and otherwise protecting the public from dangers of injury from them; also the necessity of repairing pavements and frequently water and gas mains which have been broken by the explosions of bombs dropped during these air raids.

THE DESIGNING OF CONCRETE PAVEMENTS

Discussed in the Light of Most Recent Experiences and Investigations—Importance of Drainage Still Not Appreciated—Selection of Materials—Cement, Fine and Coarse Aggregate—Reinforcement—Jointing Materials.

By CHAS. C. BROWN.

Assumption that a concrete pavement is only a little more careful laying of the concrete base for a pavement, with a wearing surface approximating that of a cement walk, is responsible for most of the failures of concrete pavements. As road builders have departed from this assumption on the path leading to special materials and special proportions and special manipulation, to better foundations and better drainage, to more scientific treatment of expansion and contraction of masses of concrete, including consideration of joints, shoulders and reinforcement, they have improved the pavement, though ill-advised experiments in all the items named have led sometimes to very serious failures.

DRAINAGE.

Drainage is a most important factor in concrete pavement success, as it is in every pavement with concrete as a base. Water softens the sub-grade and causes uneven consolidation, permits washing out, and gives opportunity for excessive action of frost, all of which cause strains in the concrete which often result in cracks. Longitudinal cracks in the concrete may result from a lifting of the edges of the pavement by frost, the sub-grade under the center of the pavement being better protected from the cold or containing less moisture to crystallize and expand in freezing. They may also occur on account of settlement or washing out of the sub-grade at the edges on account of insufficient compacting of the same and subsequent action of water, thus letting the edges settle while the center remains untouched. The same effect is produced when existing gravel or macadam road surfaces are prepared improperly for use as bases for concrete pavements. The center of such roads is almost sure to be higher than the sides and to be harder, especially on roads which have been kept up by dumping the renewal material along the center for the traffic to spread and consolidate. If the low sides are filled instead of the hard center being graded down, the compacting of the sides is likely to be inadequate and later settlement or disturbance by water or frost causes settlement of the sides and a breaking of the concrete pavement lengthwise along the top of the hard ridge.

In some soils, the absorption of water causes a swelling of the sub-grade, the action of which cannot be predicted, and cracks may form in almost any direction. In such soils sub-drains of tile or of stone-filled trenches with or without tile at the bottom, should be provided in sufficient number and with safe enough outlets to keep the soil always free from dangerous amounts of water.

Rather extended observation of road construction in several states shows that the eastern states pay much more attention to drainage than the western states, and that the states with state commission control of specifications and construction make much more elaborate provision for drainage, with very evident improvement of road conditions, and reduction in maintenance cost on account of drainage troubles is apparently much more than an offset for the greater expense of the drainage provisions.

The accompanying group of three photographs sug-

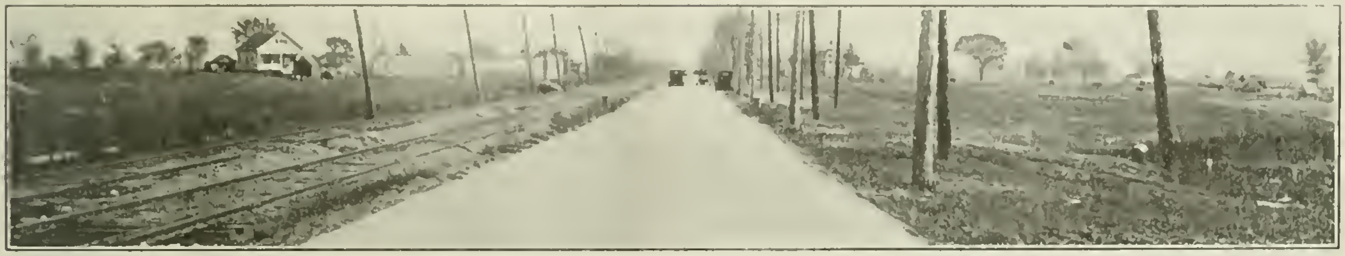


FIG. 1.—A MAIN ROAD IN WAYNE COUNTY, MICHIGAN.

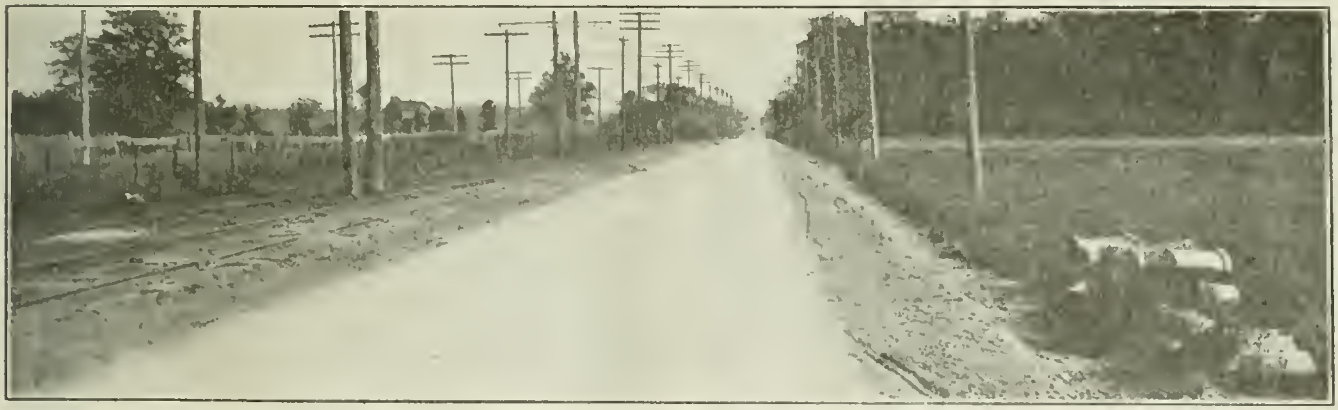


FIG. 2.—A MAIN ROAD IN WAYNE COUNTY MICHIGAN.

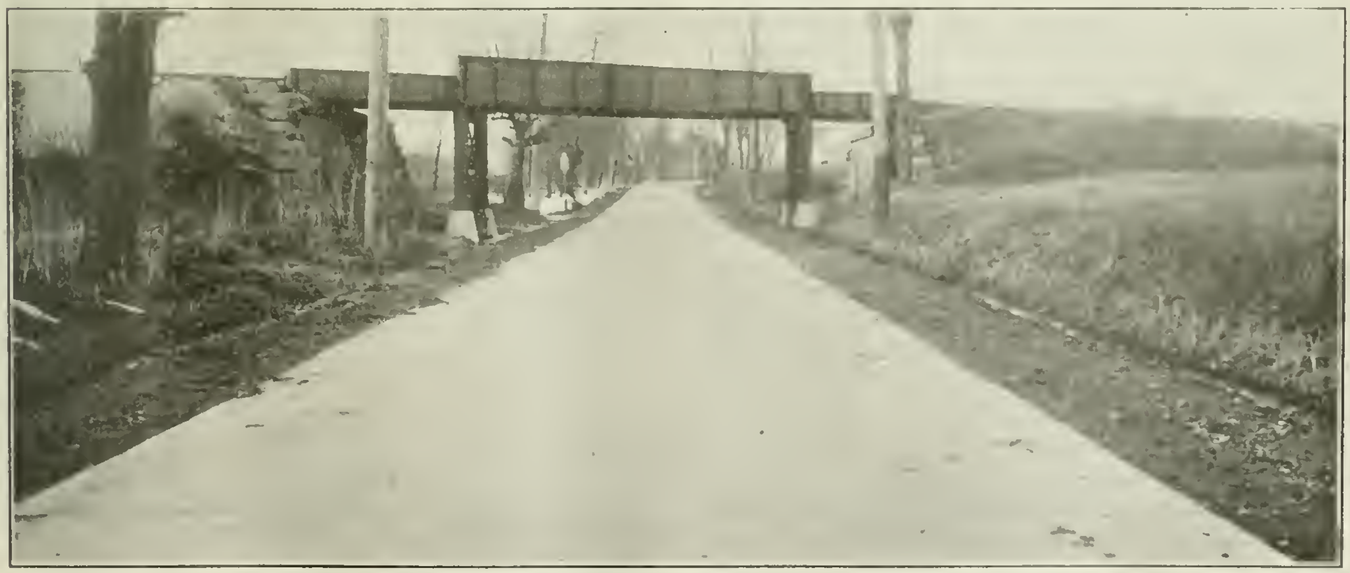


FIG. 3.—EXPERIMENTAL ROAD IN PHILADELPHIA, PA.

In Fig. 1, the excellent facilities for surface drainage seen on the right have not been made use of. If the soil is not very pervious there is danger of cracks due to lifting of blocks irregularly by frost or swelling of sub-grade by absorption of water. In Fig. 2, good surface drainage is seen on the right side, but shoulder should be compacted so as to give smooth surface and plenty of fall to gutter. Equally good drainage should be provided next to the railway track if the pavement crown is not at the left edge. Fig. 3, shows excellent opportunity for good side drainage. Ditches should be deeper and shoulders trimmed and rolled so water can flow off readily.

gests some faults in drainage in otherwise first-class pavements. Examine the photographs of roads as published in large numbers and note how few of them, especially in flat districts, have sufficient provision for surface drainage. The number fully supplied with needed sub-drainage is equally small.

MATERIALS.

Cement is now so thoroughly standardized that it is only necessary to follow the specifications provided by the American Society for Testing Materials and followed by all other societies supplying standard specifications for construction.

The aim in the study of the materials used in constructing concrete pavements is to find such materials and combine them in such a way that the wearing surface shall be impervious to water and shall be as permanent as possible, both in resistance to change in form and volume and in resistance to wear.

With respect to changes in form and volume, many studies are now in progress upon which reports cannot be made. It is believed, as the result of some such studies, that the variation in amount of moisture in the concrete is the cause of variation in volume and form, quite as much as, if not more than, variations in temperature. This suggests closer attention to making concrete waterproof, not only against the passage of water through it, but also against the absorption of small though appreciable amounts of water by the concrete, even though the porosity is not sufficient to permit the passage of measurable quantities of water through the mass of concrete. Hydrated lime is one of the materials now under experiment. Thus far the results of the experiments have not been uniform. Some engineers seem to think that the filling of the voids in the concrete, which is greatly aided by the extremely fine particles of hydrated lime, produces a waterproof mixture which removes the danger of cracks from expansion and shrinkage due to variations in moisture in the concrete. Others think that the effects of this nature are produced by the action of the hydrated lime in increasing the plasticity and flowing qualities of the mortar, thus reducing the chance of using an excess of mixing water and giving better consistency of concrete, greater density and strength. The effect of drying out of concrete is most severe when the concrete is curing or is coming to its normal condition in the road after curing, and if an excess of water is used in mixing, the contraction is excessive and is very likely to produce shrinkage cracks. Anything which will reduce the danger of using an excess of mixing water is therefore advantageous. Some engineers admit this advantage in the use of hydrated lime, but think that the advantage is not proportional to the expense, proper following of good specifications without the lime producing the same result. But apparently the lime makes the mixture slightly nearer foolproof. Integral waterproofing acts by preventing the absorption of water by the concrete and therefore prevents the accompanying expansion. The question seems just now to be in the stage where the progressives are not quite able to prove their case and the conservatives can still claim that they are able to secure equally good results by proper methods of construction according to the older specifications.

Fine Aggregate.—The most approved specifications now provide that the fine aggregate shall consist of natural sand or screenings from hard, tough, durable crushed rock or gravel, consisting of quartzite grains or other equally hard material graded from fine to coarse, with the coarse particles predominating. The differences appear in the percentages of the various grades of sizes. The reasons for these differences may be largely in the composition of the available sands. Natural sands contain a higher proportion of fine sand, but it is often possible to obtain coarse, well-graded sand by mixing a coarse sand and a fine sand from different sources. Sands in which coarse particles predominate, but which are at the same time well graded as to size from coarse to fine, have a low percentage of voids and give mortar of high strength and wearing qualities. The increase in strength, the decrease in permeability and the reduction in amount of cement required may be sufficient to offset a considerable increase in cost of the sand required to give it proper grading.

The common dividing point between sand and gravel is at the ¼-inch sieve. In some cases, especially with bank gravel for coarse aggregate, it may be advisable to use sand all of which passes a ⅛-inch mesh. The proper relation of sizes of fine and coarse aggregate is now under study.

The standard specifications of the American Society of Municipal Improvements provide for ¼-inch sand, 75 per cent between 4 and 50-mesh sizes, and 95 per cent held on 100-mesh sieve. This specification permits a rather fine sand, since the 75 per cent of coarser particles may all be close to 50-mesh size, in which case the distribution of sizes would be defective. But it may admit also the better graded sand of the specifications adopted by the 1916 National Conference on Concrete Road Building, which insure a larger proportion of the larger particles. They provide that from 10 to 50 per cent of the sand shall be coarser than ⅛-inch mesh, and not more than 20 per cent shall be finer than 50-mesh, and 5 per cent finer than 100-mesh. This provides for about 20 to 70 per cent between ⅛-inch and 50-mesh sieves, which with the 10 to 50-per cent larger than ⅛-inch and the 20 per cent smaller than 50-mesh, gives a very fair distribution of sizes to reduce the voids in the sand well toward the minimum.

Both specifications provide for a standard of strength of mortar, one stating that 1:3 mortar must be at least equal to 1:3 mortar of standard Ottawa sand, and the other that it must be equal at 28 days, 10 per cent stronger at 7 days and 25 per cent stronger at 30 days.

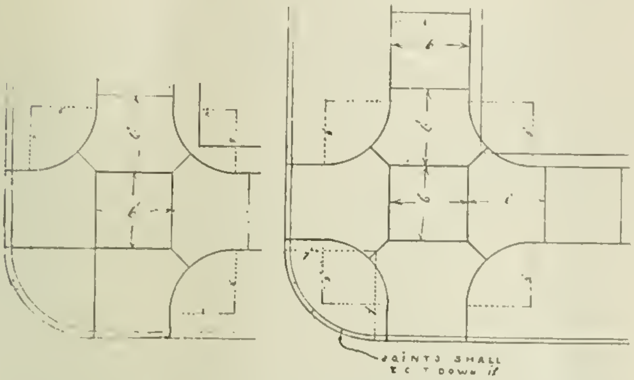
The Illinois State Highway Commission, perhaps on account of the difficulty of furnishing clean sand in many parts of that state, allows 3 per cent of clay in sand, for one-sixth of which not more than ½ per cent of loam may be substituted.

There has been too great a tendency in the past to assume that the concrete pavement must be a cheap pavement to compete with those in the field ahead of it, and so every effort has been made to keep the cost low, many times to the detriment of the concrete pavement, because the result was failure. While the endeavor is still to keep the cost low, greater emphasis is being put on high quality of materials and construction and this, together with the scientific study of its peculiar problems, is gradually improving the general average of concrete as a paving material.

(*To be concluded.*)

SIDEWALK CONSTRUCTION AT INTERSECTIONS.

The city engineer of Ogdensburg, N. Y., Geo. A. Tate, has sent us plans showing the method employed by him in constructing sidewalk intersections. The feature of these to which he calls attention is the rounding of the corners. He says that he has noticed that in cities where the intersections are made square or practically so, people walk on the grass in going around the corner, while where the corners are made as shown in these plans, pedestrians follow the curve of the walk. Where there is a tendency to cross the street diagonally, the concrete walk is carried to the circle curb. Where the walk is 8 feet wide it is blocked off into 4-foot squares. The joints in the curb are cut down 12 inches.



PLANS OF CONCRETE SIDEWALKS AT CORNERS.

MUNICIPAL WORK AND THE WAR

Opinions of Mayors in Different Parts of the Country as to the Extent to Which Municipal Public Work Should Be Continued Next Year.

A short time ago Municipal Journal wrote to a number of mayors in various parts of the country asking their opinion concerning municipal work next year—to what extent it should be continued in view of the money and labor conditions and our duties as patriotic citizens of a country at war. We are giving below typical replies that represent all the views expressed by those mayors who replied. These are discussed editorially elsewhere in this issue:

Pehr G. Holmes, Worcester, Mass.—We are planning in Worcester, to carry on municipal public work along normal lines during the coming year. I do not believe that needed developments in our city should be retarted simply because we are at war, and especially when the cessation of such work would be of no material assistance to our Government in prosecuting vigorously our part in the struggle. If, however, it should appear that by abandoning certain improvements we could materially assist the Government I should be willing to see such improvements abandoned, because I feel that the aims and ambitions of the city and individual alike should be subordinated to the needs of our country at a time like this.

President Woodrow Wilson said that civic efficiency must not be destroyed by war. In Worcester it will be our aim during the coming year to not only maintain civic efficiency, but to map our every work and action along such lines as will give a maximum of aid to the government. The upbuilding of the city during the coming year should be carried along so as to take care of the proper growth and expansion of this municipality. This is a function of city government fully as important in time of war as in time of peace. Our development, however, should be confined to those needs which are truly essential. Non-essential things can wait and must wait until such time as the situation is readjusted.

We have in the process of construction a new reservoir with a capacity of three and one-half billion gallons of water, and during the coming year no effort will be spared to rush this piece of work toward completion.

We are planning to lay larger water pipes to meet the need occasioned by a natural and healthy growth of the city, and also for the special aim of reinforcing and enlarging small mains in order that better and additional fire protection for the many manufacturing concerns working on government orders may be secured.

Close attention will be paid to our sanitary needs. The sewer system will be extended so far as it is possible to apply money and labor to take care of the needs of the city.

I consider the building of proper roads of paramount importance at all times, and especially at a time like this when more and heavier trucks are coming into use, with the result that avenues of travel are being subjected to unusually hard usage. In this connection, we have already planned to lay a considerable amount of granite block paving on a cement base, with grouted joints, and there is a large supply of material on hand to carry on this work. We also have on hand a considerable quantity of material ready for next season's work on asphalt, which will also be laid on a six-inch concrete base.

Above all things we shall exercise every possible effort to prevent any curtailment in our educational program this year. More schools are needed to house the ever-growing school children, and probably, at the very least, three six-room buildings will be erected this year. I see no reason why our normal program of schoolhouse building should be interrupted on account of the war.

I do not see any conditions that make me think it wise to postpone any essential public work in the hope of our finding cheaper labor, material or money costs, but no work that is not essential, that does not tend materially to meet some immediate public need, and so fit squarely into our one great public problem of a national effort, should or will be tolerated by me as mayor.

I would not avoid any necessary expenditure, but no unessential project will meet with my approval. Unessential things must await a time more propitious, a time when the United States government does not need all the money and all the labor it can command.

James H. Preston, Baltimore, Md.—We are considering the difficulty in the way of continuance of our public work. In Baltimore the extensions of our city improvements are done very largely by contract. For new paving for 1918 the sum of $2,500,000 has been set aside. For civic center extension and St. Paul street development about $1,000,000 will be available. Both of these come from capital account and will be done under contract. A determination of the problem as to whether the city will go ahead with these extensions will be arrived at very largely by the contract price which we make, and I have taken steps to have the contracts advertised early in January, so we may determine as far as possible the policy of the coming year. If the contractors can obtain the material and labor and go ahead with the work at anything like reasonable price, our policy will be to proceed with the work as usual. If, however, the material and labor cannot be obtained by the contractor, or the bids therefor are inordinately and unreasonably high, then Baltimore will probably suspend the extension of her public work until we can see daylight a little more clearly. The general city work,—repairs to city streets, water mains and the various engineering maintenance service—will be, of course, continued as best we can.

Charles E. Taylor, Little Rock, Ark.—I believe that a mistake would be made if the policy should be adopted at this time of stopping all municipal public work. Those engaged in manufacturing materials and equipment for carrying forward such projects would become non-producers if such policy were adopted, and skilled mechanics all over the country would be thrown out of work to which they are accustomed and forced to seek other fields of usefulness in which they would probably receive less money and, therefore, be less able to contribute, through the purchase of Liberty Bonds and otherwise, to the support of the war. It would seem to me that the better policy would be for municipalities to handle their affairs with due and proper conservatism and economy, but to continue needed public improvements of a general character.

James C. Dahlman, Omaha, Neb.—We have under contemplation the spending of $400,000 in the building of sewers. The bonds will be offered for sale in January, and if we succeed in selling them, the work will be done. We are also issuing $100,000 worth of intersection bonds, and if they sell, we will go ahead with the most of the paving we have figured on for 1918. We are authorized under the law to issue $100,000 in bonds for parks and boulevards. We have cut this down to $50,000, and if we sell the bonds that improvement will be carried out. We are also figuring on building a $100,000 police station. These bonds were sold some two or three months ago and this work will be done. The amount of improvements we shall make will depend on the sale of these bonds, as all this work is work that is absolutely necessary. We do not intend to make any that are unnecessary. However, we hope to do as much as possible. If we carry out the work in view, there will not be much decrease in the amount of improvements we shall make in 1918, as compared with those of 1917.

D. B. McKay, Tampa, Fla.—We have just finished a campaign in this city and county for a bond issue of $875,000 for an extension of the good roads system. I was prominently identified with this campaign, and my newspaper, the Tampa Daily Times, led the fight. I am glad to say that by their votes the people have decided in favor of the issuance of the bonds and the work will be in progress in a very short time. We took the position that it is a patriotic duty to connect up the highways with the main arteries leading to various parts of the state, thus relieving congested condition of the railways, and so that the farmers will be encouraged to produce larger crops and at the least possible cost. The city is not contemplating any new work at the present time, except the paving of some new streets to the region of our new shipbuilding operations.

C. D. O'Callahan (for Mayor Barber), Joliet, Ill. It will be the policy of the city to take the necessary steps during the winter months to plan and provide for an active year in street paving and sewer extensions. Having the preliminary work out of the way, we will be guided by the conditions existing in the spring as to whether or not any of this work will be prosecuted.

Wendell D. Rockwood, Cambridge, Mass.—The prices of material and labor for street construction have not yet been lifted to a point that would curtail street paving in our city. If we fail to do as much street construction during the next year or two as we have in the past, it will not be so much due to market conditions as to the fact that most of our principal streets are now well paved.

George N. Seger, Passaic, N. J.—I believe that cities are likely to suffer unless the stitch in time is taken, in other words, public property should not be allowed to deteriorate because times are abnormal, but new and extensive work should be undertaken only after very mature consideration. The average property owner has found his hand in his pocket to help prosecute the various war activities for the last six months and will have to dig deeper before this conflict is over and can, therefore, illy afford the payment of heavy assessments for improvements unless the same are absolutely necessary. There is also the question of depriving the government of the necessary man power which it is imperative for it to have by using this man power on municipal work which can be deferred until a later time. So far as the price of materials is concerned, it is my opinion that the same will not be materially less until after the war is over and only such work should be undertaken that will make for the health, welfare and growth of the community.

Harry Pillans, Mobile, Ala.—I am very much impressed with the necessity of the exercise of prudence in the expansion at this time of public works other than the most necessary ones, believing that the utmost of our energies must be devoted in sustaining the government in this war that Germany by her offenses has brought upon us. However, this city, and largely because it was believed that the work to be done was a work in advancement of the government's interests and needs in connection with this war, has just borrowed upwards of a half million dollars with which to build a pier in the upper bay below the mouth of the river, enclosing a very commodious haven, and to lay connecting tracks from this pier to the trunk railways entering the port, and is now advertising for bids for construction of these works, with the hope that the same can be put under way within a few months. Yet, the change in prices since the estimates were made promises greatly to embarrass the city in this work.

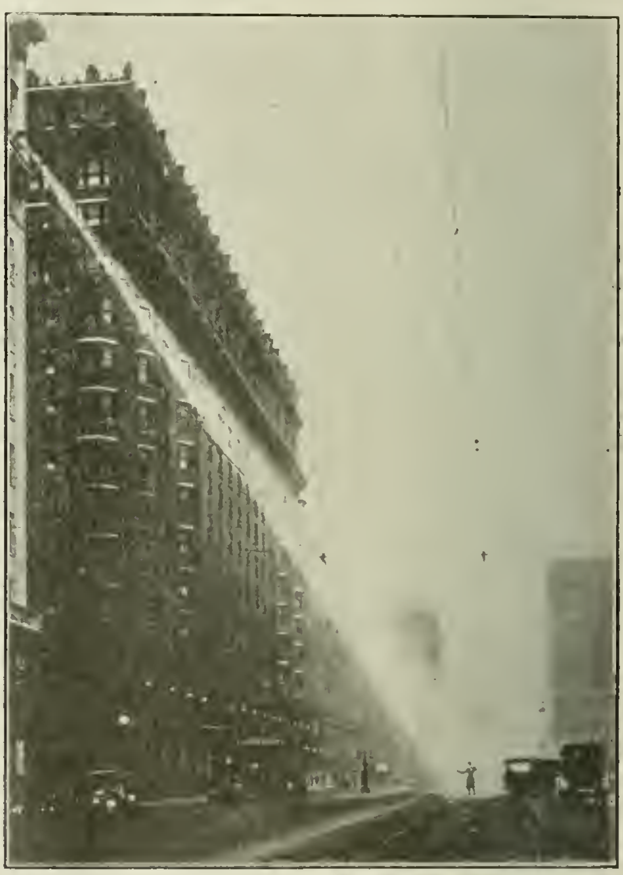
R. J. Andrews, Sioux City, Ia.—It seems to me that every community can afford and ought to forego the benefits and pleasures of public improvements to as great an extent as possible so that labor and materials required for such improvements may be released and be available for the requirements of our country now at war. There are undoubtedly a million men, now employed in one way or another by the government, who will be released from service at the close of the war, and if states, counties and municipalities can then give employment to these men, it will save us much trouble.

Charles A. Siman, Schenectady, N. Y.—I believe the exigencies of the nation demand that no extensive municipal public work or improvement be undertaken unless vital to the welfare of the people. This is a principle that will be subscribed to quite generally by municipalities throughout the country, since it will help to make available for the use of the Government the fullest possible measure of the nation's economic resources.

John MacVicar, Des Moines, Ia.—It is my judgment that the appeal of Secretary McAdoo should be respected and that municipalities and other public bodies should generally suspend all public improvements with the exception, of course, of whatever improvements are immediately necessary. Among these necessities I believe would be any public works that have a direct bearing upon the preservation of life, health and property.

TRAFFIC POLICE IN THE SPOTLIGHT.

After a number of accidents in which traffic officers were struck by automobiles, the city authorities of St. Louis devised a method of protecting the police who stand at the street intersections of the congested district. These mishaps occurred largely because the lighting at the crossings was not sufficiently bright to enable the officers to be seen on dark and foggy nights, and to remedy this condition a searchlight was placed on the tenth floor of a building at one of the corners. The ray was focussed upon the center of the crossing where the policeman stands, so that he was in the brilliant light and his signals could be seen without difficulty. The additional precaution was taken of supplying rubber coats and gloves with big gauntlets, all of white material, so that in the rain and fog he would be more conspicuous than ever. Since trying this plan, the number of accidents has diminished to such an extent that five searchlights have been installed at especially dangerous corners.



ST. LOUIS TRAFFIC OFFICER STANDING IN SEARCHLIGHT.

TRUCKING FREIGHT.

A fleet of 22 White trucks are operated for general freight haulage between New York and Philadelphia and to other cities by the Beam-Fletcher Corporation, Philadelphia. They leave Philadelphia at 8 o'clock at night to reach New York at 6 a. m., and another group leaves New York at 5 p. m., and are due to reach Philadelphia at 3 a. m.

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SHOULD MUNICIPAL WORK BE CONTINUED?

The manner in which the United States performs its share of the prosecution of the war during the coming year is of the utmost importance to every man, woman and child who expects to outlive it. In the actual fighting, we believe that our boys in France and on the ocean will give a good account of themselves. Their task is strenuous but comparatively simple; their duty is clear—to give up their lives if need be, but to sell them dearly. The real problems are to be met here at home, although the sacrifices asked are those of money and time only, and not of lives. But these also must not be sacrificed needlessly; and to insure this, no important steps involving them should be taken without serious consideration.

Another point must not be lost sight of. This war found us in a state of total unpreparedness. Peace will probably come upon us with less warning than did the war, and when we are exhausted and less able to make strenuous efforts along new lines. Let not peace find us as unprepared to take a prominent place and do our part in the reconstruction of the whole world as war found us to play our part as a fighting ally.

To city officials as such the immediate problem, and one that must be solved within the next few weeks, is that stated above: "Should municipal work be continued?" In order to learn the general opinion on this subject, we wrote to several score of mayors asking them to tell us how they felt in the matter. On another page we publish twelve replies that are typical of those received. It will be noted that all but one or two agree that all necessary work should be carried on; also that under this head should be included all having a direct bearing upon the health and safety of the citizens, and at least that portion of the street and highway system that is necessary for carrying the business traffic of the country. The differences lie chiefly in the relative emphasis placed upon the continuation of the necessary and the discontinuance of the unnecessary, respectively.

We believe that there are few who will not admit that the following are among those things necessary either because of or in spite of the war: The maintenance of existing or construction of new hard-surface pavements on the streets and roads used by traffic connected with munitions of war and the necessities of life, especially food and coal. The maintenance of existing sewerage, sewage treatment, water supply and water purification plants, and the extension of such systems to meet any growth of the city. The replacement of boilers or pumping plants by more efficient ones by which a saving can be made in the amount of coal used. The placing of meters or other changes in water department administration by which a saving in the amount of water pumped can be made. Any extensions in the water plant by which the effectiveness of fire protection can be increased. Street lighting as an aid to police protection. Street cleaning and garbage collection and disposal.

Others can be named, but this list would seem to demonstrate that a large amount of municipal work will be necessary during the coming year to maintain the health and efficiency of those who, remaining at home, must support our army in its supreme effort.

MORE POWER TO FIRE PREVENTION OFFICIALS.

"Our inspections are superficial. The fire marshal hasn't even the power of an efficient rubbish inspector. The commissioners have no authority to make anybody remedy bad conditions. We ought to have the authority to inspect buildings that are fire-traps and force the owners to remedy the conditions, but, if we should try such a thing, the owner could laugh at us. We have no power to make people do anything." These were the words of fire commissioner Thomas J. Bosquett of Detroit after a disastrous store fire last March in which a captain and four firemen lost their lives. Coroner Rothacker found that building inspection was lax because there were not enough inspectors to cover the ground. Some cannot make their rounds oftener than once in two years.

"There is no satisfactory law or ordinance giving the city proper control of such a situation. There are a number of places in which films are stored and some of them we don't know anything about because we get no track of them. A stringent ordinance should be passed immediately to remedy the situation, and the use of any building where people live should be prohibited for such purposes." City building inspector Jacob G. Hilkene of Indianapolis made this statement last May after an explosion and fire in an apartment house in which six persons died and three firemen were injured.

"Responsibility for these deaths lies in the city's failure to condemn these flimsy fire-traps. Time after time we have asked them to condemn buildings like this, but they haven't done it." This was the bitter complaint of fire chief Thomas R. Murphy of San Francisco when they brought out the bodies of his assistant chief and two of his men in a lodging house fire a few weeks ago.

These three tragedies serve to indicate the great potential danger, not only to property, but to the lives of fire fighters, due to the impotence of the authorities in abolishing fire-traps. These officials had long realized the need of fire prevention and did not have to be convinced. But their hands were chained and their orders had no strength. This is the condition in most cities. Fire prevention laws are worse than useless unless they are backed by swift, vigorous enforcement. They are a mockery because they render inspectors helpless and discouraged and tend to weaken their morale until their work becomes lax and worthless.

A strong fire prevention bureau, with full powers; an adequate, trained and honest corps of inspectors, with all the prevention work centralized in its jurisdiction, are absolutely essential to any fire prevention activities which are not merely designed to produce a false sense of security. Complete and stringent laws and an orderly routine that will bring the law to bear on cases without red tape or subserviance to building owners are the basic factors of real fire prevention. The city should have power, if a fire has occurred in any building where an order was not complied with, to secure payment by the owner of the entire cost of extinguishing the fire. This is already established in New York and Cleveland. It is more than just—it is vital to the public welfare.

There is no danger of despotism by the fire department if such powers are vested in it. The lives of the firemen are at stake as well as those of the citizens. Strength is needed to beat back the continued, underhanded attempts of the vicious among the building interests to undermine the fire prevention laws. Sometimes the attack is brazenly frank, as in the case of New York city, where the counsel for the Real Estate Board urged the extinction of the city's successful fire prevention bureau because it had spent about $2,000,000 in the last six years and had caused property owners to spend about $18,000,000 to carry out its orders.

The powers of fire prevention bureaus must be carried to the point of those of New York's bureau—and beyond. No one questions the right of the health department to quarantine a smallpox patient. The man who maintains a fire-trap is a worse potential danger to the community.

PRESSING SEWAGE SLUDGE

Methods and Appliances in Use—Character of Sludge Affects Results—Preliminary Operations—Pumping and Conveying Sludge.

Sewage sludge, by whatever process obtained, contains such a large amount of water that it is difficult to handle it and almost impossible to dispose of it without nuisance unless the water content is reduced. Sludge may be dried by air-drying or by artificial heat, or it may be dewatered by centrifugal machines or by filter presses. It may also be produced with a consistency suitable for handling, although containing 80 per cent moisture, by the Dickson process, first employed on a large scale at Dublin. This consists, essentially, in the addition of 0.5 per cent of yeast to the raw sludge, allowing it to ferment for from 20 to 24 hours at a temperature of from 90° to 94° F., and then, when the sludge floats at the top, drawing off the underlying liquor.

Air-drying is the process most commonly employed, generally by drawing it off onto sludge beds. Next to this, filter pressing has been used most generally. The latter method was discussed by Kenneth Allen, engineer of sewage disposal of the Board of Estimate and Apportionment, in a paper prepared for the American Society of Municipal Improvements; from which the following has been abstracted.

USE OF FILTER PRESSING.

Dewatering sewage sludge by filter pressing with the plate type of press has been brought to a point where its efficacy and cost can be close predicted. With fresh settled or precipitated sludge and the addition of from 0.5 per cent to 3.0 per cent of lime and a pressure of 70 or 80 pounds per square inch, a firm, satisfactory cake can be produced.

Several of the newer forms of press promise an improvement on the older plate press, but experience with them in handling sludge has been so limited that their comparative merits are not yet definitely known.

The great demand for sludge pressing in the past was the result in large measure of the practice of chemical precipitation. This kind of treatment is unquestionably on the decline for normal sewages, but in the mean time the activated sludge process has appeared and promises to be adopted with success in many situations, and the necessity of promptly dewatering the large volumes of watery sludge it produces may lead to an increased demand for sludge pressing in the next few years. Moreover, the fact that new processes for recovering the valuable ingredients in sludge combined with the increasing demand for grease and ammonia all tend to a development of methods of dewatering, of which filter pressing, up to the present time, is the most prominent.

Quoting John T. Thompson of Leeds: "Progress already made in this direction shows that in time it will be possible by artificial processes to get rid of all sludge without causing any nuisance, and make sufficient by the sale of by-products at least to pay the full cost of disposal."

SEWAGE SLUDGE.

The density, composition, appearance and odor of sludge depend on the sewage from which it is derived, whether from the separate or combined system, domestic or with a large proportion of trade-wastes, fresh or stale, etc., and also on its manipulation, whether by mere settling, chemical precipitation, digestion in septic or Imhoff tanks or aeration in the activated sludge process.

The volume produced daily per 1,000 population is, according to Dr. Imhoff, 1.57 cu. yds. in the sedimentation tank, 0.79 cu. yd. after drawing off the supernatant liquor, 0.262 cu. yd. after digestion from combined sewers and 0.131 cu. yds. from separate sewers.

Sludge Data.

Derived from	Moisture Per Cent	Cu. Yd. per m.g.	Lb. per cu. yd.	Dry Matter Tons per m.g.
Imhoff tanks	80-85	2- 4	1740-1840	0.161
Plain sedimentation	88-96	4-10	1700-1780	0.580
Chemical precipitation ...	86-94	20-30	1710-1790	1.435
Activated sludge process	98-99	20-80	1690-1700	0.67

With strong sewages or those carrying much grit, especially where treated by plain sedimentation or in Imhoff tanks, these figures may be exceeded. The weight of sludge from chemical precipitation is, of course, increased by the chemicals added.

Different sludges vary in their adaptability to pressing. Plain settled sludge or a sludge greasy in its nature is difficult to press. If fine in composition, it flows too freely through and then clogs the filter cloths, leaving the cake in a pasty condition that will not cohere.

Septic sludge varies greatly in consistency, depending on the thoroughness of digestion. Ordinary septic tank sludge is fine in composition and offers much the same difficulty as plain settled sludge in passing through the filter. Elsner, however, claims that septic sludge, as well as lignite sludge, is more amenable to pressing without the addition of chemicals than is plain settled sludge.

Considering the granular condition of well-digested Imhoff sludge and its freedom from matter of a viscid or mucous nature, it would seem probable that this might be dewatered readily by pressing, provided a fine filter medium be used. But as such sludge can be air-dried easily at slight cost and without offense, there seems little likelihood that pressing will be used to any extent for dewatering.

Precipitated sludge is most favorable for pressing because the lime used in precipitation gives it a certain "body," enabling the cake to cohere without becoming pasty and smearing up the filter cloths.

PRELIMINARY OPERATIONS.

Before pressing the sludge from sedimentation or precipitation tanks, it is usually drawn or pumped to a sludge-settling or concentration tank, dosed with milk of lime, settled for from 12 to 24 hours and the supernatant liquor drawn off. This reduces the contained moisture to 85 or 90 per cent, and the volume perhaps 50 per cent. Although the cost of treatment and disposal of sludge cake and the volume of the latter are all increased by this addition of lime, this is more than counter-balanced by the reduction in the time and cost of pressing.

Sulphuric acid, where used in connection with a greasy sewage, is also valuable in concentrating the sludge. The most notable works of this kind are those at Bradford, England, the largest sludge-pressing plant in the world, where 128 presses deliver 3,700 lbs. of cake each per run. The sewage, which contains 440 p.p.m. of grease, is first screened, then precipitated with 2.8 tons of sulphuric acid per million U. S. gallons of sewage. This produces 40 tons of sludge per m.g., containing but 80 per cent moisture, which is again screened, heated and delivered to the presses.

Sulphuric acid is also used for sludge concentration at Oldham by Dr. Grossman. Here 0.3 per cent by weight of acid is added to sludge of 87 to 90 per cent moisture and after resting, the clear liquor is drawn from beneath, leaving the concentrated material with from 70 to 74 per cent moisture.

In this country experiments in the use of sulphur dioxide have been made on Boston sewage by E. S. Dorr and R. Spurr Weston, with particular reference to the recovery of grease and fertilizer. The method of treatment is patented and is known as the "Miles" process. It was found that one ton of sulphur dioxide per m.g. of sewage produced, after settling 8 hours, 6.7 tons of sludge, 85.8 per cent moisture. By further settling for 26 hours there can be obtained 4 tons of concentrated sludge 80 per cent moisture in a condition suitable for pressing. The advantage claimed in the use of sulphur dioxide is the thorough separation of the grease from the sewage and the low moisture in the sludge.

In general it is found best, if not always necessary, to add lime to almost any sludge before delivering to the press. Even this may not be sufficient where the sludge is high in grease, as was found at Frankfort. Here, to render the process effective, resort was had to the addition of sulphate of alumina and heating the presses, but this procedure was abandoned on account of the cost. A preferable way is to crack the grease with sulphuric acid, as is done at Bradford, settle, draw off the clearer liquor and press the sludge, now reduced to 80 per cent moisture, in hot presses. The cake is thus relieved of the greater part of the grease, which passes off with the drainage liquor, is recovered and sold.

A similar process was tried at Cassel, Germany, a few years ago, producing dried fertilizer and grease, as at Bradford. But here, though the wet sludge averaged 18 per cent grease, the process was abandoned after three years' trial on account of the fuel required to heat the wet sludge and dry the cake.

The amount of lime which should be added to sludge before pressing depends on the character of the sludge, on the amount previously used for precipitation, etc. In English practice it usually varies from 0.5 per cent to 1.0 per cent by weight of the wet precipitated sludge, or from 3 per cent to 7 per cent of the pressed cake.

John T. Thompson, chemist and acting manager of the Knostrop sewage works at Leeds, England, concluded from experiments that good cake, 60 per cent moisture, may be readily produced from fresh sludge by the addition of 1 per cent lime and suggests the following simple test for the foreman to apply: "If the press effluent is just alkaline to phenolphthalein a good cake can usually be obtained in 45 minutes, but if the effluent gives no color reaction it may take 1½ to 2 hours to get the same result."

Several English plants report using 8.4, 10.1, 37, 47 and 84 lbs. per cubic yard respectively. Septic sludges, however, have required as much as 9.6 per cent to 15 per cent of the weight of the pressed cake. This is excess of lime required above that for mere precipitation, and should not be added before precipitation as it has an unfavorable effect on the effluent, promoting secondary putrefaction, deposits of sludge on the stream bed and the clogging of filters and retarding nitrification. In 1916 Worcester, Mass., used, for pressing 57.9 lbs. of lime per 1,000 gals. of sludge, and Providence, R. I., 80.6 lbs.; the former producing 13,192 tons of cake during the year and the latter 23,511 tons.

Lignite sludge is produced by adding finely-ground lignite mixed with water and then, as it passes through a baffled trough, a solution of sulphate of alumina. Sludge with 90 per cent moisture is produced at Spandau in a condition for pressing as it comes from the tanks, but the cake contains 8 or 10 per cent too much moisture, so that it disintegrates easily if exposed to the rain, and should therefore be stored under cover.

Before the sludge is pumped to the presses it should be coarse-screened to remove any rags, sticks or other coarse matters, which might clog pipes or channels or bring unequal pressure to bear on the plates of the press, causing them to crack. The screening may be accomplished by downward discharge of the sludge through a basket or cage screen, or by forcing it or allowing it to flow through a bar screen or rack, or by use of a coarse band screen.

CONVEYING SLUDGE.

From the concentration tank the sludge usually flows to a pump well, whence it is pumped to the presses. The slope of chute or pipe necessary to cause sludge to flow through it is 1:10 to 1:15 for settled sludge containing at least 90 per cent of water, the steeper grade if it contains much sand and coarse material. If the sludge contains about 95 per cent of water and little sand, a slope of 1:100 may be sufficient, but 1:80 is better. For sludge obtained with interrupted operation a fall of 1:40 to 1:50 is necessary. At Fitchburg the slope is 1:90, and the new concrete channels for Imhoff sludge at Columbus are sloped 1:56.

Force mains for sludge, if less than 8 in. in diameter, offer undue resistance, although in Mannheim it is conveyed 1¼ miles in iron pipe 5.85 in. in diameter. On curves, the radius of the center of the pipe should be at least five times its diameter. Changes of cross-section should be avoided to prevent clogging, but if unavoidable, means for back-flushing should be provided.

A pipe carrying an acid sludge generally remains clean, sludge containing chlorine in excess will produce rusting, and unslacked lime or an excess of lime tends to cause deposits. If allowed to stand for a considerable time in a pipe, especially if permitted to drain, sludge may adhere to the inside of the pipe and cake, and be difficult to remove. Nevertheless, with proper precautions, long lines of sludge mains are satisfactorily maintained in operation. In several plants in England sludge is pumped for four or five miles through 8-in. to 12-in. pipe.

PUMPING SLUDGE.

Screened sludge may be pumped by almost any type of pump if designed for such service; but pulsometers, chain pumps and ordinary ejectors are inefficient and suitable only for occasional or emergency use, or where the volume is so small that economy of power may be disregarded. The Shone and other pneumatic ejectors are well adapted to such use, being automatic in operation and with few moving parts. The air lift has been used for pumping Imhoff sludge abroad and in Fitchburg, Mass. There seems to be no good reason why it would not be applicable to other sludges, although the released air might increase the diffusion of odor, which at best is often offensive where sludge is handled.

Membrane pumps and air receivers are in use in Europe. The former consists of two cylinders connected by pipes, one cylinder having a diaphragm near each end, the other a plunger which causes high and low pressure alternately in the first cylinder between the diaphragms, which thus draw the sludge in through one port and expel it through another. A rubber membrane lasts 8 or 10 months. The air receiver consists of a tank similar to a boiler, furnished with large inlet and outlet sludge connections and connected to an air compressor or vacuum pump. The receiver is filled by gravity or by exhausting the air inside and the sludge is then expelled by admitting air under pressure. They usually operate in pairs, one filling while the other is being emptied.

Centrifugal pumps are used for sludge but should be specially designed with large clearances. It has a higher efficiency than the contrivances just named, but is not adapted to pumping thick sludge under high pressures. Reciprocating plunger pumps are usually to be preferred to centrifugal pumps and in small installations are sometimes the best to adopt on account of their simplicity and ability to operate under sudden and great variations of pressure.

SLUDGE PRESSES.

The most common form of filter press consists of a series of plates 30 to 54 in. square, set parallel, depressed surfaces forming a cell between each two successive plates. Each plate has a large hole in the center. When in use, cloths placed between the plates form linings to the cells or flat bags, into which the sewage is pumped under pressure, the liquid escaping through the cloth and the solid matter being retained in the cell. The sludge is subjected to a pressure of 50 to 120 lbs. per square inch. When water ceases to leave the cells, the compressed cakes of sludge are removed from them for disposal. Pressure may be maintained from 15 to 90 minutes, depending upon the nature of the sludge and the degree of solidity desired. The cost in Worcester, Mass., of pressing a daily average of 37,600 gallons of sludge to cakes of 72.8 per cent moisture was $5.71 per ton of solids in 1916, or $7.05 per million gallons of sewage. The cost in Providence was $2.78 per million gallons of sewage, or $3.38 per ton of dry solids.

Other filter presses have been experimented with, the Kelly, Sweetland and Berrigan being descried by Mr. Allen. The Kelly consists of a cylindrical shell in which are placed a number of parallel filter leaves, each carrying a bag stretched over a frame through which the sludge is strained, the leaves being supported by a carriage that slides in and out of the cylinder. The sludge cake is formed on the outside of the bags by pressure of about 40 lbs. in the cylinder, the liquid entering the bag and flowing off through a pipe. The carriage is removed and the cake loosened from the bags.

The Sweetland operates on the same principle, but instead of the filter leaves being removed from the cylinder, the cylinder is made in halves, the lower half hinged to the upper and bolted in place while pressure is on, but being swung down out of the way when the cake is to be removed, which is done by blowing air outward through the bags.

The Berrigan or Worthington press consists of a number of unbleached muslin bags inclosed in a bag of special fine canvas. These are hung vertically between plates that are drawn together by means of a toggle joint, squeezing out the superfluous water. The pressure is gradually increased to about 60 lbs. per square inch. In the Milwaukee experimental plant a press reduces about 5 tons of cakes per 24 hours to 75 per cent moisture. T. Chalkley Hatton estimates the cost of operating this as $3.46 per ton of cake produced.

HAULING STONE IN TRAILERS IN OREGON.

The commissioners of Lane county, Oregon, a few months ago purchased some large dump wagons to be used as trailers to a caterpillar tractor in hauling broken stone for road construction. They found this method much more economical than either teams or motor trucks, and are contemplating the purchase of several more similar wagons. On one road job the cost of hauling by trailers was about 25 cts. per cubic yard as against 65 cts. asked for hauling in trucks.

TO PURCHASE LIBERTY BONDS.

Douglas County, Oregon, in making up its budget last month, inserted an item of $50,000 for the purchase of Liberty Bonds of issues to be made within the coming year, with a provision that when the bonds mature, principal and interest shall be used to construct a new county court house.

FREE WATER IN SANTA ROSA.

Santa Rosa, Cal., is a city of about 12,000 population, covering two square miles. It operates a sewage disposal farm, from which it realized $1,187 during the year ending June 30th, $536 of which was from the sale of hay, $393 for pasturage, $100 for fertilizer sold, the balance for sale of wood and corn tops and rent of land.

In the administration of its water works plant there are several interesting details. The system includes about 36 miles of mains and 184 fire hydrants. There are 2,464 taps in service. Water is pumped from wells by electric power, a complete steam pumping plant being held in reserve.

Each residence is allowed 10,000 gallons a month free for domestic purposes only, a charge of 25 cents per 1,000 gallons being made for the second 10,000 gallons, 20 cts. for the third 10,000, and 15 cts. for all above this. (10,000 gallons would give 55 gallons per capita per day for 6 persons in a house, or 67 gallons for 5 persons.) Of the 2,464 taps, 2,108 are metered, with free allowance; 29 are churches, parks and public buildings with unlimited free allowance, 38 are metered and all consumption is paid for, and 289 are on a flat rate, unmetered. It is estimated, using the rates above, that during the year ending June 30th the public buildings, churches, etc. used without charge $1,749 worth of water, and that the fire hydrants, at $60 a year, would yield $954. The cash receipts were $5,648; a total credit of $8,351 (allowing nothing for the free water for domestic use). The total debits were $10,216, leaving a deficit of $1,865—less than $1 a year for each residence receiving free water. However, $10,885 was required to meet interest and sinking fund charges, which would increase the cost for free domestic water to about $6 a year for each tap.

The deficit is about the same as is experienced every year, and is made up by transfers from the general fund. "The city in general derives considerable benefit and distinction as being a city of lawns and beautiful gardens, which no doubt can be credited to the generous allowance of free water."

ROADS AND THE ARMY TRUCKS.

In our issue of December 22 we referred to the fact that roads had been picked out over which thousands of army trucks now under construction were to travel to Atlantic ports for shipment to France, thus relieving the railroads of the burden of carrying them and also such freight as the trucks themselves could carry; and we called attention to the importance of constructing and maintaining the roads over which these trucks must travel in the best possible condition to withstand the duty thus imposed upon them. In another article on the same page we suggested the advisability of using snow plows for filling in snow ruts and leveling off snow-covered roads, with a view to protecting the roads and also to keeping them in beter condition for traveling while the snow remained.

Both of these items are suggested by information which we have received from John Laylin, consulting highway engineer of Norwalk, Ohio, and secretary-treasurer of the Ohio Engineering Society, relative to the passage of the first fleet of thirty army trucks through Norwalk on Sunday, December 16. The fleet arrived in town from 7:30 to 8:30 p. m. on Sunday, after a strenuous trip over roads drifted with snow by the storm that had preceded and accompanied them from Detroit. One of the officers accompanying the fleet said: "We take our hats off to Huron county. It was the first dragged road we struck and it let us come to our limit of 12 miles per hour from Bellevue here." County engineer Starbird had dragged this road with snow plows and smoothed out the ruts in preparation for the fleet. The beneficial effect of this was especially appreciated by the drivers of the fleet from the fact that, as described by Capt. E. B. Butchers of the U. S. Engineers, "The snow drifts in Michigan had not been taken care of at all. We were delayed five hours at one drift. And the counties this side of Toledo had not done much better, either, until we struck your county and it certainly made a hit with us."

ARMY TRUCKS PARKED IN NORWALK, EN ROUTE FROM DETROIT.

(Right here let us say that we can see no reason why this use of snow plows is not as legitimate a duty of the highway department as the use of scrapers in summer or as any other work devoted to keeping a highway in the best condition for traffic. As shown by this instance, some road officials have adopted this as a practice, but those who have done so, we fear, are greatly in the minority. As stated in a previous article on the subject, the saving of the road surface from the destruction caused by all traffic following in one rut is an even more beneficial effect of snow plowing than that of temporarily facilitating travel.)

The illustration shows the army trucks parked along the curb in Norwalk, where they spent Sunday night, there being no garages in town whose doorways would admit them. Many of them carried signs such as "Packards for Pershing," "Detroit to Berlin." As shown, the trucks all had storm curtains enclosing the driver's seat, while the truck itself was covered by canvas stretched on hoops like the old fashioned "prairie schooner." Every car had a search light in front. Most of the fleet were army trucks, but there were also four Dodge passenger cars, and two of the trucks were equipped as tank cars. The trucks were all 3-ton Packards. The train was in command of Capt. Bronson and Lieut. C. A. Riley, in addition to which there were seventy-eight enlisted men—mechanics, drivers and cooks. The local paper, the Reflector-Herald, noted for the interest and encouragement of the women that most of the boys wore knitted helmets, sweaters and the long wristlets such as are being furnished so abundantly by the women of the country. This paper says: "The road system was mapped out, started and completed, as far as gone, under Messrs. Laylin, Herrick & Starbird, and the wisdom of their high standard insisted upon is now amply attested. The army men are lavish in their praise of Huron county roads and bridges, and we may thank the efficiency of our engineers for these compliments."

FIRE APPARATUS OPERATION.

Average Number of Miles Run per Gallon of Gasoline Last Year by Each Kind of Apparatus—Reports from Two Hundred and Fifty Cities.

On the two pages following this will be found figures concerning mileage made per gallon of gasoline by fire apparatus as reported by fire chiefs of those cities not included in last week's issue. There is great variation in the figures and, as stated last week, this is to be expected when we consider the great differences in mileage run in the different cities (see table in December 15th and 22nd), the speed made, weight of apparatus, and experience of and care exercised by the drivers.

Averaging all the figures for each kind of apparatus, we obtain the following: Chief's cars, 12 miles per gallon of gasoline, average; chemical and hose with ladders, 7.4 miles; chemical and hose without ladders, 8.9 miles; hook and ladder trucks, 6.9 miles; triple combinations, 6.5 miles; hose wagons, 9.9 miles; tractors, 3.9 miles; chemical engines, 9.3 miles; gasoline pumping engine with hose, 6.2 miles; same with chemical, 6.1 miles; same without hose or chemical, 4.7 miles; gasoline-driven steam pumper, 5.2 miles; fuel or service wagons, 10.2 miles; repair wagons, 10.6 miles; squad wagons, 5.0 miles; water towers, 6.2 miles.

MOTOR APPARATUS OPERATION. MILES RUN PER GALLON OF GASOLINE (Continued).

City and State.	Chief's Cars.	Chemical & Hose With Ladders.	Chemical & Hose Without Ladders.	H. & L. Trucks.	Triple Combinations.	Hose Wagons.	Tractors.	Chemical Engines.	Gasoline Pumping Engine and Hose.	Gasoline Pumping Engine Without Hose & Chem.	Gasoline Pumping Engine With Chemical.	Gasoline Driven Steam Pumper.	Fuel or Service Wagons.	Repair Wagons.	Squad Wagons.	Water Towers.
Minnesota:																
Anoka	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bemidji	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Detroit	....	15	....	....	10	....	....	....	....	....	....	....	....	....	....	....
Duluth	11½	1½	....	1½	1½	....	....	....	....	....	....	....	....	....	....	....
Minneapolis	9	1½	....	1	1	....	2	....	....	....	....	....	....	....	2.6	....
Virginia	12	10	....	....	8	....	....	....	....	....	....	....	....	....	....	....
Winona	15	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mississippi:																
Vicksburg	12	3	....	3	....	....	....	....	....	....	....	....	....	....	....	....
Missouri:																
Cameron	....	12	....	....	....	12	....	....	....	....	....	....	....	....	....	....
Moberly	....	2½	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Springfield	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Webster Groves	18	15	....	....	12	....	....	....	12	....	....	....	....	....	....	....
Nebraska:																
Nebraska City	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Norfolk	....	9	....	15	....	....	....	....	....	....	....	....	....	....	....	....
Nevada:																
Reno	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....
New Jersey:																
Hackensack	14	10	....	12	....	....	....	....	6	....	....	....	....	....	....	....
Jersey City	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roosevelt	....	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....
New Mexico:																
Raton	18	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....
Roswell	14	3	....	....	....	9	....	....	....	....	....	....	....	7½	....	....
New York:																
Auburn	10	4	....	3	....	....	....	....	....	....	....	....	....	....	....	....
Batavia	....	8	....	7	....	....	....	....	....	....	....	....	....	....	....	....
Canastota	....	13	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Geneva	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Johnson City	12	....	7	7	....	9	....	....	....	....	....	....	....	....	....	....
Liberty	....	10	....	....	....	10	....	....	....	....	....	....	....	....	....	....
Mamaroneck	....	8	....	....	....	....	....	....	8	....	....	....	....	....	....	....
Mechanicsville	....	10	....	....	....	10	....	....	....	....	....	....	....	....	....	....
New Rochelle	8¼	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Peekskill	15	....	10	6	....	....	....	....	10	....	....	....	....	....	....	....
Rye	....	8	....	6	....	8	....	....	....	....	....	....	....	....	....	....
Silver Creek	....	....	....	....	....	6	....	....	....	....	....	....	....	....	....	....
Solvay	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Watkins	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....
Waverley	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
White Plains	9	9	....	....	....	....	....	....	....	....	....	....	....	....	9	....
Yonkers	8–10	....	6–8	6–8	....	....	....	....	6–8	....	....	....	....	....	....	....
North Carolina:																
Raleigh	7½	5½	....	5½	....	....	....	....	....	....	....	....	6	15	....	....
Ohio:																
Akron	7	2	3	....	3	....	2	....	....	....	....	....	....	....	....	....
Alliance	18	8	....	....	8	....	....	....	....	....	....	....	....	....	....	....
Bryan	14¼	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Columbus	11½	5½	....	....	....	....	....	....	....	5½	....	....	....	....	....	....
Conneaut	....	....	....	....	6	....	....	....	....	....	....	....	....	....	....	....
East Cleveland	15	6	....	6	6	....	....	....	4–6	....	....	....	....	....	....	....
Elyria	14	....	....	4	....	....	....	....	4	....	....	....	....	....	....	....
Findlay	15	....	....	....	....	....	....	10	....	....	....	....	....	....	....	....
Lakewood	6.1	2.8	....	3.4	....	....	....	....	1.7	....	....	....	....	....	....	....
Marietta	....	12	....	....	6	....	10	....	....	....	....	....	....	....	....	....
Orrville	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Portsmouth	17	....	....	4	3	....	....	....	3	4	....	....	....	....	....	....
Salem	....	....	5	....	4	....	....	....	....	....	....	....	....	....	....	....
Springfield	12	8	....	6–8	....	....	....	....	8	....	....	6	12	....	....	....
Toledo	6¼	....	1.4	2.4	0.6[1]	....	....	....	....	....	....	1	6	....	....	0.5
Warren	14	10	....	....	10	....	....	....	....	....	....	....	....	....	....	....
Weston	....	....	....	14	....	....	....	....	....	....	....	....	....	....	....	....
Youngstown	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Oklahoma:																
Ada	....	8	....	....	5	....	....	....	....	....	....	....	....	....	....	....
Chickasha	12	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....
Oregon:																
Astoria	15	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rosebury	18	18	....	....	....	....	....	....	....	....	....	....	....	....	....	....

Pennsylvania:																
Altoona	15	4–10	....	....	....	....	....	....	....	....	....	10	....	....	....	....
Bangor	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....
Beaver Falls	12	....	....	....	8	....	....	....	8	....	8	....	....	....	....	....
Blairsville	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Carlisle	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Easton	....	1½	....	....	1	....	....	....	....	....	....	....	....	....	....	....
Franklin	13	8	....	....	8	....	....	....	....	....	....	....	....	....	....	....
Galeton	....	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....
Girardville	....	12	....	....	....	12	....	....	....	....	....	....	....	....	....	....
Jeannette	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....
Oil City	18	....	....	....	....	14	....	....	....	....	....	....	....	....	....	....
Philadelphia	8	5	8	8	....	....	8	....	8	....	....	....	....	8	....	8
Quakertown	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....
Reading	12	8	....	8	10	....	7	12	10	....	....	7	....	....	....	....
Scottdale	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Turtle Creek	....	....	....	....	9	....	....	....	9	....	....	....	....	....	....	....
West Berwick	....	....	....	....	7	....	....	....	....	....	....	....	....	....	....	....
Rhode Island:																
Woonsocket	11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
South Dakota:																
Madison	19	8	8	....	....	....	....	....	....	....	....	....	....	....	....	....
Tennessee:																
Clarksville	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....
Jackson	....	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....
Johnson City	....	....	....	....	13	....	....	....	....	....	....	....	....	....	....	....
Nashville	15	....	....	....	5½	....	4	....	....	....	....	....	....	....	....	....
Paris	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Texas:																
Amarillo	10	4	....	....	....	....	....	....	1	....	....	....	....	....	....	....
Austin	20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Brenham	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Denison	10	....	....	10	....	....	....	....	10	....	....	....	....	....	....	....
Georgetown	18	20	20	....	....	18	....	20	....	....	....	....	....	....	....	....
Houston Heights	16	....	12	12	....	12	....	....	....	....	....	....	....	....	....	....
San Marcos	20	14	....	....	10	....	....	....	....	....	....	....	....	....	....	....
Victoria	15	8	14	10	....	....	....	....	....	6	....	....	....	....	....	....
Utah:																
Logan	20	....	8	....	6	....	....	....	....	....	....	....	....	....	....	....
Ogden	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Salt Lake City	5½	1½	....	1	2½	4½	1	....	7½–2½	....	2½	....	....	14	5½	....
Vermont:																
St. Johnsbury	....	....	4½	4½	....	....	....	....	....	....	....	....	....	....	....	....
Virginia:																
Covington	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Harrisonburg	....	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....
Newport News	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roanoke	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Washington:																
Bellingham	15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ellensburg	....	50	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Olympia	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Puyallup	11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Seattle	7	....	....	1.3	....	1.6	1.25	3	....	....	....	1	5½	....	1¾	....
Tacoma	8	3	....	2½	....	....	....	....	3	2½	....	2½	....	....	....	....
West Virginia:																
Elkins	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Fairmont	15	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wheeling	....	8	....	4	....	....	....	....	....	....	....	....	....	....	....	....
Wisconsin:																
Antigo	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Appleton	15	....	....	5	....	7	....	....	....	....	....	....	....	....	....	....
Ashland	12	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Fond du Lac	12	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Manitowoc	15	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....
Merrill	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Milwaukee	7.4	1¾	....	1¼	....	....	1¼	....	1.4	....	....	....	....	5¾	2.1	....
Oshkosh	12	8	8	8	....	....	....	....	....	....	....	....	....	....	....	....
Rhinelander	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Superior	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

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[1] Aerial.

The WEEK'S NEWS

The Scranton Street Department Strike Ended—The Road Situation in New Jersey, Massachusetts and Pennsylvania—Sewage Disposal Practice in Iowa Found Poor—Cincinnati Raises Water Rates—Contend Over "Readiness-to-Serve" Charge in Toledo—Firemen Threaten Strike—New York Firemen Exhausted by Alarms in Zero Weather—Cities Vote for Commission and Against City Manager—City Manager Charter Law of New York Upheld—Pittsburgh Street Car Wreck Kills Score.

ROADS AND PAVEMENTS

Scranton Street Workers' Strike Ended.

Scranton, Pa.—The strike of the 255 employes of the public works department has been settled, the men receiving a substantial increase in wages. In spite of the attitude of mayor E. B. Termyn, the council finally decided upon the increase, after listening to S. J. McDonald, president of the Central Labor Union. According to the terms of the compromise, the street sweepers, the park laborers and the laborers on unpaved streets get a thirty-five cent increase, their wages going up from $2 to $2.35. The scale agreed upon for the other men provides $2.75 for teamsters; chauffeurs, $3; blacksmith, $3.50; helpers, $2.25; repair men, $3; assistants, $2.75; painters, $3.20; pavers, $2.50; sewer repair men, $2.80; sewer men, $2.50; drill runners, $2.80; quarrymen, $2.50; ashes and garbage collectors, $2.50; sewer laborers, $2.40; concrete mixers, $2.40.

New Jersey Road Law Upheld by Court.

Trenton, N. J.—The constitutionality of the Edge road act, providing an estimated revenue of $15,000,000 for road purposes during the next five years, has been upheld by the supreme court. The opinion by justice Bergen disposed of all the constitutional questions raised in the three consolidated litigations attacking the act and held that all of them were without merit. The substance of the findings of the court were that the title of the act is not defective; that first and fourth class railroad property is not subject to the tax imposed, but that this does not render the act invalid; that second-class railroad property comes within the purview of the act and is properly subject to taxation under it; that even though the Society for Establishing Useful Manufactures may have an irrepealable contract exempting it from local taxes this fact would not invalidate the act, and that bank stock is taxable under the act, which would not be invalidated by the fact that local assessors may have failed to include it in their returns. Governor Edge expressed gratification upon learning of the Court's decision. At about the same time the governor received a letter from General George W. Goethals, saying that no matter what his duties might be at Washington his services and advice would still be at the disposal of New Jersey to the extent that he might be able to give either. In the face of two decisions from the supreme court, one by chief justice Gummere, refusing to grant a writ of certiorari to review the road act and the present decision, governor Edge said it would be useless to attempt to still further retard work on the highway system. If an appeal is taken, however, the governor said he will ask for a special session of the Court of Errors and Appeals in order that the work may not be delayed any longer than is absolutely necessary.

In discussing the provisions of the act, justice Bergen held that the road tax is clearly a state tax, although levied upon property classified as property upon which municipal taxes are "assessed, levied and collected." The court then considered the contention that the title of the act is defective because it applies to all real and personal property, while the body of the act limits its application to property upon which municipal taxes are levied. Remarking that the title does not read "all" real and personal property, justice Bergen said that even if it did, it would not be open to objection.

Consideration was next given the argument that the act was invalid, as not including all railroad property, which has been divided into four classes, on the first and fourth of which a direct tax is laid in which the municipalities take no part and which is applied by the state for its own use. The third class is admittedly subject to the act; its applicability to second-class railroad property was disputed. Disposing of the point involving first and fourth class property, justice Bergen said there is no legal rule better settled in this state than that the classification of railroad property for the purpose of taxation by a special scheme does not violate the constitution.

One of the most important points raised in the litigation involved was the inclusion of second-class railroad property in the law. On this question justice Bergen said in part: "In each of the three cities involved (Newark, Jersey City and Passaic), the value of second-class railroad property, as fixed by the state board, was included in the ratables, and the rate of taxation computed on that basis, so that if this class of railroad property is not within the law, that is, not property upon which municipal properties are assessed, levied and collected, then each municipality, having within its borders second-class railroad property, would be required to pay to the state on account of road taxes, more money than could lawfully be collected, and to that extent the assessment would be unjust."

After outlining the method of levying and collecting the tax on second-class railroad property, justice Bergen said: "Substantial features of the local property of railroads upon which taxes are thus raised for strictly municipal purposes, bring such property within the classification of the road tax act, by which the Legislature described the entire class of property subject to such tax by its general characteristics for purposes of taxation, and not by special features that bore only upon the convenience of collecting. A classification that was valid for this latter purpose might not be valid for the former object. It is fundamental that the validity of a classification depends upon the legislation that is proposed to be based upon it, hence the corrolary is that a classification shall be considered in the light of the proposed legislation, especially when necessary to render such classification constitutional. In our opinion second-class railroad property is taxable under the act of 1917."

Justice Bergen held there is no merit in the contention that the road act does not include franchises of street using public utility corporations. Such franchises, he said, are either exempted by reason of classification from local taxation or subject to the act under consideration, and if, under the act, they are subject to local taxation and have been omitted by the local assessors, that is an error in execution of the law, which does not make it unconstitutional.

The court found no reason to doubt the capital stock of banks and trust companies are subject to taxation under the road act. The valuing of this property and the assessment and collection of the tax, the court pointed out, is all performed by the local officers, and the mere fact that the statute fixes the rate, does not make it a state, as distinguished from a municipal tax.

War-Time Road Building in Massachusetts.

Boston, Mass.—Highway construction on a war basis is the feature of the tentative plans for next year's work decided upon by the state highway commission. There will be very little scenic road construction and almost no work, except in maintenance, upon the routes that can be singled out as devoted largely to pleasure motor touring. For the time being the development of the road system of the state along these lines will be abandoned. Instead of spending money upon extension of the highways into new sections of the state, constructing mountain roads in the Berkshires and the like, it is the present intention to put almost all the road money into the roads already built, whose importance from military and commercial standpoints is thoroughly established. These roads will be made wider and more durable, the curves will be improved, the bridges strengthened, and the surface kept in the best of condition. The commission does not contemplate attempting to build a purely military type of road, with a hard surface of 24 feet and wide shoulders on both sides for the passage of infantry. Such a type of construction would be beyond the financial ability of the commission's ordinary revenue and does not seem necessary. But the roads that lead between the principal cities of Massachusetts and towards the large cities of adjoining states that lie along the coast and that radiate from important military centers will be widened in many places and made more substantial. In making these plans the commission is not controlled primarily by the prospect of the movement of troops over the roads, but by the increased use to which these roads will be subject, under war conditions, in the movement of freight in heavy motor trucks. Already the railroad congestion has made it necessary for a large number of shippers to turn to motor trucks for long-distance hauls of merchandise, especially in cases where immediate delivery is required. New work for this year has been finished on the state highways. Although the commission and its contractors have had to labor under most difficult conditions in regard to the supply of labor and materials, and has had to meet much higher prices, it has succeeded in building a mileage almost equal to that constructed in 1916, the mileage of new road built this year being 53½ as compared with 54 last year. There are now 1,208 miles of state highway in Massachusetts.

It is interesting to note at present that the so-called Seretto contract, for making which the commission was much criticised last spring, has proved of great value in enabling the commission to carry on its road work. This contract assured the commission of a supply of labor, when it would have been unable to obtain it had it not been provided for by this contract, according to which Seretto was to be put on a percentage of the cost, with six cents per cubic yard of excavation as fair compensation for him, and a corresponding sum for ledge work. He was to furnish superintendent, foremen, laborers, small tools, teams, camp outfit, and so on, and to make the original payments to his men. The state was to have its own bookkeeper on the job to check up the items and was to repay him all of this actual cost which he paid out, plus the six cents, or its equivalent, for his personal remuneration. Old contractors predicted that the system would prove more expensive to the state, but highway commissioner Kemp says that the results have abundantly justified the new departure. Seretto's contract was to cover work on at least four, and possibly seven, of the routes in the five western counties, which were to be built under the well-known western counties' special act, which was passed two or three years ago. It was estimated that the average cost per cubic yard of excavation would be 60 cents and that 10 per cent on this would be sufficient margin for the contractor. If he could keep the cost down to 50 cents, and still get his six cents, then he would be getting 12 per cent of his outlay; but if the cost rose to 80 cents then he would suffer accordingly. Consequently, with this inducement, the contracts have worked out to the ample satisfaction of the commission. Later, when they advertised several other jobs, with substantially the same specifications, to be done under the old system, the commission could not get from any of the bidding contractors any figures which were in the same class with the cost by the Seretto method, with one exception, and that was materially higher than would have been the cost under the new plan.

Separate Grading from Construction.

Harrisburg, Pa.—It is possible that the state highway department may let contracts for grading work separately from regular road construction next year. This subject is receiving serious consideration because of the advance in price of materials, the difficulty in obtaining labor and the car service interruptions, caused by the priority order of the government. The specifications are to be studied and taken up very soon for determination. Thus far only one or two contracts have been let for grading as a separate proposition, and observations have been made on them. In a number of instances county and borough authorities have favorably commented upon the plan for separate contracts. Something like twenty-six counties have agreed to co-operate with the state in road work on a "fifty-fifty" basis and sixteen boroughs have accepted invitations to unite in improvement of streets which are on the line of state highways. The department announces that it will hereafter make a charge of $2.50 for sets of plans and specifications for road work. Heretofore plans were to be seen at offices of engineers of the department. Under the new arrangement plans may be bought outright by interested persons and studied at their offices or homes. The announcement says that the price is at cost. The department recently announced that provision is being made in all contracts by the state highway department for road construction whereby the contractor would be relieved in the event that time is lost and completion of the improvement delayed through inability to obtain deliveries of materials because of the priority order in the use of open-topped cars on the railroads. In a dozen counties the state was compelled to suspend construction work of its own and maintenance operations generally were seriously interfered with where the department was dependent on transportation of materials by rail. Where the stone needed could be obtained from quarries along the highways and prices were reasonable work went on as long as the weather permitted. Repair work on the main highways in use for motor truck traffic and which are expected to be much traversed this winter has been rushed, and trucks have been pressed into state service to haul stone and other materials.

SEWERAGE AND SANITATION

Sewage Plants in Poor Condition.

Des Moines, Ia.—In the 2,300 cities, towns and villages of Iowa there are about 450 water works plants, 180 sewage systems and 100 sewage treatment plants, according to J. H. Dunlap, associate professor of hydraulics and sanitary engineering at the state university, who was engaged last summer by the state board of health to inspect water works, sewers and sewage treatment plants of the state. "Of the thirty-seven plants visited during the summer only three can be said to have been in good condition," the engineer declares. "All three of these plants had features which were needing immediate attention, but in general they were giving excellent results. The other thirty-four plants were either not being operated properly or were so badly overworked as to make first-class operation impossible." Professor Dunlap suggests two possible means of relieving this state of affairs. Either a representative from the state board of health must be permitted to visit all the sewage treatment plants and supervise their operation or some one individual in each town and city having a sewage treatment plant must interest himself in the plant and see to it that a competent man is in charge. "If no local man can be found who can take full charge, then an expert from outside should be engaged to supervise the operation of the plant," Professor Dunlap says. "At relatively small expense good results can be secured in this way. One competent sanitary engineer could be engaged to do this work for several towns. The expert might place a local man in direct charge and himself supervise the operation of the plant by making an occasional visit to it at the critical times of the year. The small expense involved is in reality a saving if the future cost of present neglect is taken into account," the university engineer concludes.

Systematic Infant Welfare Work.

Cleveland, O.—A system by which it is intended to have the city assume direct responsibility for conditions connected with proper care of expectant mothers is soon to be put in operation by the city health department in cooperation with Western Reserve university obstetrical department. The plan has the approval of city health commissioner Bishop; Dr. R. A. Bolt, chief of the bureau of child hygiene, and Miss Cecelia Evans, director of the university nursing district. The proposed work is expected to achieve four principal objects: 1—Reduce the number of still births. 2—Decrease the number of infants' deaths, due to prenatal causes. 3—Lower the number of deaths at confinement. 4—Lay the foundation for better health of babies and mothers. "Proper prenatal care and proper obstetrical services will prevent probably 60 per cent of fatalities in confinements," says Dr. Bolt, child hygiene chief. He said that in the first ten months of 1916, of 15,752 birth, 612 were still births or born dead, and during the same period in 1917, the still births numbered 604, out of 17,615 total births. He said comparison between the two periods showed only a slight improvement. During the whole of 1916, Dr. Bolt said, the total number of fatalities among babies, directly traceable to prenatal conditions, numbered 1,383. Of these, 749 were dead at birth and 634 died within two weeks of birth. He declared experience had shown that more than a majority of these cases were preventable. During the same year, he explained, 123 mothers died of the results of child birth, and in fifty-nine cases death was caused by infection—a condition which could have been avoided with modern and scientific care. Dr. Bolt said while the death rate among babies under one year of age, from gastro-intestinal and other diseases to which infants are particularly subject, have slightly decreased in recent years, the death rate here of mothers, and infants during the first few weeks of life, has not diminished, but has even increased somewhat. A preliminary trial of the plan is to be made in the so-called university nursing district, which embraces the center of the city where exist practically all of the conditions that will be met in outlying districts. Dr. Bolt said that this territory is particularly well fitted as a starting point because of the location within its boundaries of the infant welfare center, the E. 35th street maternity dispensary and the nurses' training school.

According to the outlined program, the infant welfare center is to be utilized as a maternity welfare center and clearing house for all maternity cases found in the district, except those now cared for in the Western Reserve maternity or St. Luke's dispensary. Public health nurses in this district are to refer all maternity cases for primary examination to this center. Student nurses in the district are to be given instruction in prenatal work at the center, followed by a more intensive study at the E. 35th street maternity dispensary.

The nurses are to investigate social and economic conditions in all cases, and all information obtained is to be recorded, so that the physician in charge at the maternity welfare center may decide upon proper treatment of each case. Where persons are financially able to employ a private physician, prenatal care will be given in cooperation with such doctor. Where a private physician cannot be employed, the mother will be cared for at the center up to confinement, when the case is normal, or she will be referred at once to the dispensary, when the case is complicated or serious.

Particular attention is to be given to cases in which midwives are engaged. "The proposed maternity welfare center," Dr. Bolt said, "will be considered simply as the first unit of a city-wide plan to extend this public service gradually to all the health centers in the city. The work is to be unified under a bureau of maternity welfare of the division of health, with an obstetrical chief, selected by the commissioner of health on the nomination of the professor of obstetrics of the Western Reserve medical college, who will act as expert consultant. Assistants will be appointed by the chief of the bureau, the commissioner of health and the consultant."

City May Remove Trees Choking Sewers.

Tacoma, Wash.—The city of Tacoma and Charles D. Atkins as commissioner of public works have won the final decision in the suit against the city started by a property owner for treble damages because the city removed two poplar trees from the street in front of the property. The city contended that the roots from two poplar trees choked up the sewer pipes in 1913 and again in 1917, forcing the city to go to considerable expense in taking the pipes up and replacing them. The complainant asserted that the city did not have a right to remove the shade trees. The supreme court held that the case was a question of the rights and powers of the city in the city's streets and found for the city.

WATER SUPPLY

Water Rates Raised By Cincinnati.

Cincinnati, O.—Water rates to all consumers have been advanced 25 per cent beginning with the new year. The minimum monthly charge will be increased 30 to 40 cents. The new scale means an advance of from 8 cents to 10 cents a hundred cubic feet for metered service. Service director Hornberger made the announcement following a series of conferences with mayor Puchta and J. A. Hiller, general superintendent of the water works, at which the necessity of additional revenue was urged. Service director Hornberger estimated that $120,000 a year will be added to the revenue of the water works department under the new scale of rates. The 25 per cent increase will also affect unmetered services. For services in the unincorporated villages outside city limits, the meter rate is fixed at 11 cents per 100 cubic feet, a minimum of 50 cents being charged, while 12½ cents per 100 cubic feet will be the rate for consumers in incorporated villages.

First Year of Municipal Operation Successful.

Santa Monica, Cal.—Operating expenses of the municipal water department for the first year were only 49 per cent of the receipts, according to a report prepared by superintendent Walter S. Dole. Old machinery, plants and site rendered superfluous by new equipment are worth nearly $100,000, which can be turned into the city treasury when the property is sold. The net profit is $39,598.92, despite numerous expenditures for improvements. Superintendent Dole says that the cost of operation will be greatly reduced during the present year.

Municipal Plant Rates Not Subject to State Regulation.

Dallas, Ore.—The state supreme court has adhered to its original opinion, that the water plant at Dallas is owned by the city, and therefore its rates are not subject to regulation by the public service commission. After the commission had issued an order reducing rates, H. V. Gates appealed, contending that he was merely operating the plant under a lease and the city was the real owner. The court, however, held that the city of Dallas should not be compelled to pay the cost of litigation, but that it should fall on Gates.

STREET LIGHTING AND POWER

City Loses in Franchise Case.

New York, N. Y.—Justice Delehanty of the supreme court has handed down a decision dismissing the suits brought by the city against the Central and the Northern Union Gas companies and the Westchester Lighting Company, the three companies supplying the Bronx. The city had sued to deny the Bronx companies the right to lay their pipes in the streets on the ground that they had not properly obtained the necessary franchises. Justice Delehanty finds that all of the companies in question had acquired their franchise rights from their predecessors, which had in turn obtained them from the various local governing bodies. The justice finds that the companies have been using the streets for the last half century and that they have regularly been paying their franchise taxes to the city. He intimates that the city had no business bringing the ouster suits, anyway, as that was a matter for the state to take up, if such sovereign power thought the companies were operating without due process of law.

Arbitrators to Decide on "Readiness-to-Serve" Charge.

Toledo, O.—The Northwestern Ohio Natural Gas Co. will receive its 35 cents monthly readiness-to-serve charge temporarily, according to a decision by city counsel. The 48,000 Toledo gas consumers will pay about $201,600 every year in addition to the regular rate for natural gas. The ready-to-serve charge began Dec. 26 and will continue until a board of arbitrators decides the charge is unreasonable. If the board decides the charge is reasonable it will be continued indefinitely. An ordinance granting the gas company permission to charge 35 cents a month for service in addition to the regular rate for gas, was passed by council and another repealing ordinance which fixed the rate at 35 cents and prohibited a service charge. In return for the passage of these two ordinances the gas company is to withdraw its schedule filed with the Ohio public utilities commission, establishing a rate of 42 cents for gas. If the public utilities commission agrees to substitute the service charge proposition for the 42-cent schedule already on file, Toledo's gas controversy is over. The gas company officials expect the city councils of Maumee, Perrysburg, Bowling Green and North Baltimore to follow Toledo's lead. The ordinance provides for the selection of a board of arbitrators to investigate the gas company and appraise the value of its property. If this board decides that a 35-cent readiness-to-serve charge is unreasonable, the company will refund the amount which has been paid by consumers under that charge. One member of the board will be selected by the mayor of Toledo, another member by the gas company and, if these two members fail to agree on any point, a third member will be appointed by the governor of Ohio. The ordinance stipulates that the third member must not be a resident of Lucas or Wood counties. The company officials objected to having the member be a local man, saying they desired the board to be "free from local influence." Each party to the agreement must appoint its member on or before Feb. 1, 1918, and if either side fails to appoint by that time, the other side may go ahead and make the appointment. The company insisted throughout negotiations that it should not agree to bind itself to any rate, but said the council could abolish the service charge at any time. The matter was adjusted by incorporating in the ordinance a clause which automatically suspends the service charge whenever the company charges more than the prevailing price for gas.

Allow Twenty Per Cent Power Rate Increase.

Bluefield, W. Va.—Upon the agreement of representatives of the Appalachian Power Co., of Bluefield, and a number of consumers of power, who had appeared as protestants against the company's application to increase rates, the public service commission has entered an order permitting an increase. The rate raise will be twenty per cent over the rates now being charged to all consumers using over fifty horse power of current, the increase to be effective from Dec. 1 and run to Jan. 1, 1919.

FIRE AND POLICE

Military "College" for Firemen.

Ayer, Mass.—A military college for firemen has been opened at Camp Devens under the direction of lieutenant John F. McAree, chief of the cantonment's fire department. Twenty-five picked men of the half hundred that compose the fire-fighting forces at the camp commenced study of chemistry, including explosives, and courses in French, German and Italian. This latest innovation in the training of New England's national army division is intended, according to chief McAree, who was a captain in New York city department, to prepare the men for any emergency, including transfer for duty abroad. All the men in the camp's permanent department are former members of fire departments in seventeen New England cities and towns. The new college will also give the men a chance to take a course in practical laboratory work, and it is the intention to fit them so that when they return to civil life they will be available for higher positions in the fire departments which they left when they were drafted for military service.

Firemen's Strike Threat Because of Inexperienced Board.

Danvers, Mass.—The members of the town's fire companies, totalling about a hundred, have decided to resign in a body if the two new members of the board of the engineers recently appointed by the board of selectmen take office. As a result, the board of selectmen addressed letters to the mayors of Salem, Peabody and Beverly, asking the executives of those cities to render what aid they can to Danvers in event of fire and the town being without the protection of a department. The announcement some time ago that Frank W. Budgell and Thurman Leslie were to be made members of the board of fire engineers, in place of Michael H. Barry and Daniel W. Wheelwright, caused a storm in local fire circles. The men to be dropped are men of experience in fire matters, while it is claimed Messrs. Budgell and Leslie have not had such experience. The selectmen threaten action by the district attorney if the men strike. Chief Barry considers the action of the selectmen in appointing the new board of fire engineers as illegal, as do the other members of the board. The old board intends to stand its ground and serve the town as usual. Chief Barry says that the law provides that the fire engineers must attend all fires, and that the firemen must take their orders from the engineers. The engineers are the first to enter a burning building, ascertain the extent of the fire and whether the building is safe for the firemen to enter, and then give orders as to how the fire shall be handled. It is upon their judgment and experience that the firemen depend, and upon which they frequently risk their lives. Chief Barry inquires if the citizens of the town blame the firemen for not desiring to trust their lives, or even to take orders at a critical time, from a group of inexperienced men, who do not even know a male from a female coupling.

Town Hall Burned.

West Boylston, Mass.—The town hall in West Boylston was completely destroyed by an early morning fire, entailing a loss on structure and furnishings of between $25,000 and $30,000. There was insurance upon building and contents of $15,000. The cause of the blaze, which apparently originated in the basement of the building, is not known. When the residents in the village were aroused the building was even then engulfed in the flames and the efforts were largely directed toward the saving of other buildings, a shower of sparks from the burning structure falling upon a wide area. Had it not been for the snow upon the roofs it is probable that many dwellings would have been the prey of the flames. As it was several houses caught fire but the flames were quickly subdued. The destroyed building was a comparatively new structure, replacing the town hall which was within the area seized by the Metropolitan water and sewerage board for the Wachusett reservoir.

Hundreds of Alarms on Record Cold Days.

New York, N. Y.—The New York fire department has seldom had a busier twenty-four hours than those of Dec. 30, one of the coldest days in the city's history. In the first sixteen hours of that period, from midnight Saturday till 8 P. M., there were 123 fire alarms in Manhattan and the Bronx and 125 in Brooklyn and Queens. Altogether, during the whole day some 300 alarms were turned in from the whole city. About two-thirds of these, however, came from automatic systems, and were due to the snapping of wires or freezing of pipes in automatic sprinkler systems. While these alarms were only technically "fires," they had two serious results. One was the damage done by water from bursting pipes, which insurance men estimated at a total running into hundreds of thousands; and the other was the added burden laid on firemen, who had enough to do answering alarms for real blazes. Of the real fires the great majority were due to the cold weather. Most of them were due to explosions following the thawing out of frozen steam pipes or frozen water-backs in stoves. Overheated ranges in some cases set fire to nearby hangings and woodwork; oil stoves exploded, and one blaze in Brooklyn was caused by the overturning of a charcoal burner. One death and perhaps a dozen serious injuries occurred in various parts of the city. Firemen were kept going, with hardly a moment of rest all day long; indeed, it was said that battalion chief Owen McKernan was not out of his automobile, except when supervising the actual fighting of a fire, from 5 o'clock in the morning till 10 at night. Serious fires were few, but those that did occur necessitated not only the drawing together of great numbers of fire fighters with much apparatus, but the shifting of other companies to cover the areas left bare, and these companies always had to be withdrawn from districts where alarms were coming in every few minutes. The slippery condition of the ice-covered streets delayed the apparatus in going to blazes, and the end of the day with so little damage done in proportion to the number of alarms was a tribute to the amazing activity with which the fire department covered the town despite the handicaps of unusual weather and an enormous amount of work. The situation was most serious early in the evening when a big livery stable fire in east Harlem resulted in the turning in of five alarms, calling together all the apparatus north of Fifty-ninth street, in Manhattan, at the same time that a three-alarm fire was burning in the Long Island Railroad freight yards in Long Island City. While the Harlem fire was still burning fiercely another blaze broke out within four blocks of it, and because there was no apparatus left in northern Manhattan to answer the first alarm a second had to be turned in, bringing engines from the Bronx. The most serious fire of the day was in the stable, due to oil boiling over when it was being heated by a watchman. As a result 250 horses kept in the basement and two upper floors of a five-story brick building were all destroyed. For a time the entire block was threatened and hundreds of families of the crowded tenements were cleared out by the police into the bitter cold of the streets. Some were given refuge in station houses. An adjoining stable and garage was damaged but all horses and trucks were taken out and the building saved from destruction. In the meantime firemen in Long Island City were busy with the blaze in the freight yards of the Long Island railroad, which did damage estimated at about $125,000, and destroyed the bills of lading and records of goods contained in nearly a thousand freight cars which themselves escaped the flames. The fire broke out apparently in the office of the freight transfer station, a corrugated iron building some 200 feet long and 100 feet wide. It was discovered by two brakemen on passing cars. By the time the yard fire department got there the interior of the building was all ablaze, and three alarms were at once turned in for the city department in order to save the hundreds of freight cars within reach of the fire. Quick work by switching crews got all but two of these out of the way. There were about 200 alarms the next day, and both men and apparatus are still recovering.

Fire in Ship Plant on Meadows.

Kearny, N. J.—A fire in a plant adjoining the structures of the Federal Shipbuilding Company on the Kearny meadows threatened seriously for a time the work being rushed on shipping by the government. The fire in the office and storehouse of the Post & McCord Company was visible over a wide stretch of country. The concern has been working day and night turning out steel plates and other parts for the shipbuilding company plant. The buildings which were destroyed were of wood and intended as temporary structures, but in them were valuable drawings and plans. Firemen were called from Jersey City to help those from Kearny and engine 9, of Jersey City, lost its smokestack while speeding under an overhead crossing. Permanent water mains had not been laid and the temporary system was utterly inadequate. The firemen also were bothered by a temperature of 7 degrees below zero and a brisk wind, but they prevented flames from spreading to the federal plant. Fire chief C. W. Greenfield of Kearny started an inquiry to discover the cause of the fire.

Fire Trucks Must Heed Speed Limit.

Anderson, Ind.—The state law limiting the speed of motor vehicles in cities applies to fire trucks as well as other vehicles, circuit judge Pence has ruled, and Anderson's fire trucks will not be allowed to exceed twelve miles an hour in making runs to fires. The ruling was made in court in the case of a complainant, who sought judgment for damage done his property when fire chief Alcord ran into his porch while on the way to a blaze. The plaintiff was awarded $30.

Fight Big Fire in 500,000-Ton Coal Pile.

Stockton, Ind.—A fire in the coal pile at the storage yards here of the United States Steel Corporation, which had been dormant for weeks, became active again and systematic efforts were made to check it. The pile contains about 500,000 tons and is half a mile long. Steam arose from the coal the length of two city blocks and at places flames broke out. Adjoining coal piles containing hundreds of thousands of tons of coke and bituminous coal were safeguarded from the flames. Although the coal pile is on the shore of Lake Michigan, there is no water pressure to fight the fire there and construction crews had to put in a temporary pumping station, while other gangs laid pipelines. A fleet of the heaviest steamboats from the Gary steel plant, as well as several freight trains from the Kirk yards of the steel trust were sent to Stockton. Huge shovels were used to dig gaps through the coal pile so as to segregate it into units, while trainload after trainload of the less damaged coal on the top of the pile was removed. Though fires have attacked the reserve piles of the several steel companies in the Calumet district several times, they never proved to be serious. The present fire seemed to have been quenched by the cold and zero weather, but with the thaw and warmer weather the pile suddenly began to show signs of life.

GOVERNMENT AND FINANCE

City Manager Plan Defeated by Two Cities.

Salina, Kans.—The proposition to adopt a commission form of government, with a city manager, has been defeated here by a substantial majority of 208. The vote was light. This is the second time Salina has rejected a commission government plan.

Wymore, Neb.—The city has defeated the city manager plan by a vote of 176 against and 96 for the plan. Wymore is the first town to vote on the plan since the new law was passed by the state legislature. The opponents of the plan claimed that if a city manager was elected the municipal lighting plant would be done away with and this is thought to have influenced the vote.

New York City Manager Law Held Constitutional.

Albany, N. Y.—The optional city government law enacted by the legislature of 1914 is constitutional, according to a decision by the Court of Appeals. The decision was made in a taxpayer's action which was brought to restrain the cities of Watertown and Niagara Falls from organizing under what is commonly known as the city manager form. The court brushed aside the allegations that the enactment of the law was violative of the state constitution in that it was too broad a delegated legislative power or that the legislature had parted with any of its constitutional functions in permitting cities to select and operate under this new form of government. The optional city government, the Court of Appeals held, was not passed in contravention of any federal or state constitutional provisions. The opinion of the Court of Appeals pointed out that the contention that the legislature was giving cities powers of self-government which were in conflict with the constitution could not be justified. In conclusion the Court of Appeals said: "The whole trend of modern thought and recent legislation is toward vesting in each municipality the management of its local affairs, and I have been unable to discover any valid reason why the present act, which is a step in that directon, should not be given a fair trial without interference from the court. The act is not an attempt upon the part of the legislature to shirk its duty or to delegate to another body the power vested solely in it. On the contrary, it is to permit each locality to determine for itself the form of government which it will have, based upon modern ideas rather than upon a form of government which has been tried and in some respects at least found unsatisfactory. I, for one, am unwilling to subscribe to the doctrine that the legislature had not the power to do this."

Watertown, N. Y.—While the city manager form of government opposed by the voters in 1915 is validated by the decision of the Court of Appeals, it is not yet definitely known what the effect will be on the coming administration of the city. Early this year the present suit was instituted by city officials whose terms of office had not expired and who would be put out of their positions by the new form of administration. The case was heard in special term by Justice Emerson, who considered the law of 1914 irregular and declared it unconstitutional, maintaining that the decision of the taxpayers for a change in government was void and that the old form should remain in force. The appellate division of supreme court, at Rochester, sustained the ruling of the trial justice. The case went to the Court of Appeals this fall. Acting under the decision of justice Emerson, as sustained by the higher tribunal, party organizations and election officials proceeded under the usual custom in preparing for the recent election. No provision was made to select commissioners. The usual nominations for city offices were made and mayor Isaac R. Breen and his administration was retained. The course to be followed is not known. It is possible that the administration-elect will continue. It may be that a special election must be held at once to choose commissioners under plan C of the city manager scheme, and that the present administration will conduct affairs pending the new government. It seems more likely that the new administration will remain in for the year, and that commissioners will be chosen at the next general election in 1918. Special legislation will be necessary to get the city out of the tangle. Plan C, adopted by Watertown, provides a mayor and four commissioners to be elected by the people. Each is to receive a salary of $750 per annum. They have power to choose a city manager and fix his salary. The city manager is virtually the city executive. This change would not affect the board of education, which is governed by special legislation, or the library board. All other city boards are dissolved and all other city departments brought under the direct supervision of the commission.

Niagara Falls, N. Y.—The city manager plan of government, plan C, which has been in operation here since January 1, 1915, has been declared constitutional after a number of reverse decisions. It is understood that the effect of the decision of the court of last resort will be that the men elected members of the city council two years ago will continue as such, and that the men elected to office last fall under the provisions of the old federal charter will not be inducted into office. This decision will further mean an election for commissioners, next year, when otherwise no city officers would be elected. The terms of councilmen W. Acheson Smith and William H. Gillett expire with this year, and before the court action was brought these two men had announced that they would not accept renomination. Under the provisions of the public officers law, however, they will continue in office until their successors have qualified. In the ordinary course of events their successors would be chosen at the general election in November, 1918. It might be possible to hold a special election for that purpose, but such special election would have to be called by the governor of the state. It is not known what effect, if any, the decision will have on the tenure of office of the city manager, Ossian E. Carr.

Two Cities Adopt Commission Form.

Rahway, N. J.—Commission government rule was adopted in Rahway by a majority of 234. The total vote cast was 1,309. Of these 766 were for commission, 532 against and eleven ballots were rejected. It was the third time that a vote for commission rule had been submitted, first in 1911, when 1,370 votes were cast, and again in 1913 when the vote was 1,189.

Corsicana, Tex.—At a special election this city has approved the new charter proposed for consideration by the voters. The new form of administration is the commission plan.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

"Municipal Affair"—Licensing Patrol Service.

(Cal. App.) Licensing and regulation of private patrol service of system within designated limits of city of Oakland is municipal affair, within Const. art. 11, § 6, investing municipalities with full power to legislate in all matters embraced within term "municipal affairs," uncontrolled by general laws.—Ex parte Hitchcock, 166 P. 849.

Police Government—Judicial Interference.

(S. D.) Courts will not interfere with municipal corporations in their internal police and administrative government, unless they are transcending their powers, or some clear right has been withheld, or wrong perpetrated or threatened.—City of Mobridge v. Brown, 164 N. W. 94.

Existence of Municipal Power—Judicial Decisions.

(Cal.) Any fair reasonable doubt concerning existence of municipal power is resolved by the courts against the corporation.—City of Long Beach v. Lisenby, 166 P. 333.

Traveling on Right Side of Street—Backing.

(Cal.) Ordinance requiring vehicles to travel on right side of street does not prohibit chauffeurs in congested districts from backing automobiles into limited parking space.—Sheldon v. James, 166 P. S.

Manufacturing District—Right to Use Streets for Foot Traffic.

(N. Y. Sup.) Although city district was almost entirely used for manufacturing purposes, pedestrians still possessed right to use streets therein.—Stanley v. Jay St. Connecting R. R., 166 N. Y. S. 119.

Assessing Pipe Line of Other Municipality—Basis.

(N. J.) Under 4 Comp. St. 1910, p. 5084 (§4a), 5085, assessment on pipe line belonging to another municipality must be based on value of land alone and not on improvements. —Jersey City v. Huber, 101 A. 378.

Delay in Questioning Assessment—Results.

(N. J.) Delay of municipal authorities in questioning assessment made by second municipality on pine line belonging to first municipality will not prevent subsequent attack on such assessment.—Jersey City v. Huber, 101 A. 378.

TRAFFIC AND TRANSPORTATION

Many Killed and Injured in Car Wreck.

Pittsburgh, Pa.—Twenty were killed and scores were injured, several seriously, when a runaway street car swept through a tunnel and crashed into an iron pole at the end. Several investigations are being made of the disaster and the motorman of the car is under arrest in the hospital. The motorman said that when he had gone about 500 feet into the tunnel he noticed that the car was gaining in speed and he attempted to stop it. The airbrake, however, refused to work and the handbrake was powerless. The reverse was applied but the overhead switch went off and the car ran on. The car, which was packed, crashed into the pole and about two-thirds of the roof was torn off. The car ran into the corner of a store. The motorman's testimony is different from that of the motorman of the car following. The latter said that the ill-fated car had stopped in the tunnel and because the conductor could not get out through the crowd, he had gone out of his own cab and put the trolley of the other car on the wire. Passengers gave still more incriminating evidence. They say that there appeared to be ill-feeling between the motorman and the conductor all through the trip. When the trolley left the wire the conductor asked the motorman to put it back but the latter refused angrily. When the trolley was replaced, according to the passengers, the motorman threw his controller over forcibly and in anger. In his version, the motorman denies that the trolley had left the wire and that the car had stopped.

"Skip-Stop" to Save Fuel.

Columbus, O.—The city council has given Columbus Railway, Power & Light company permission to eliminate alternate stops on all lines outside the business section. Harold W. Clapp, general superintendent of the company, stated that the adoption of this plan will save from 400 to 500 tons of coal per month. Mr. Clapp also asked that the proposal to reduce the evening service about 50 per cent. be authorized as an emergency measure. He promised that full service would be restored when conditions become normal. No action was taken on this request.

NEWS OF THE SOCIETIES

Calendar of Meetings.

Jan. 8.—CANADIAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, Montreal, Can. Secretary, Fraser S. Kieth, 176 Mansfield ntreet, Montreal.

Jan. 9.—NEW ENGLAND WATER-WORKS ASSOCIATION. Annual meeting, Boston, Mass. Secretary, Willard Kent, 715 Tremont Temple, Boston.

Jan. 12.—NORTHWESTERN SOCIETY OF HIGHWAY ENGINEERS. Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 14.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York City. Secretary, F. A. Molitor, 35 Nassau street, New York.

Jan. 15-17.—VIRGINIA GOOD ROADS ASSOCIATION. Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 16-17.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, New York City. Secretary, Charles Warren Hunt, 29 West 39th street, New York.

Jan. 22-24.—AMERICAN WOOD PRESERVERS' ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, F. J. Angier, B. & O. Railroad, Mt. Royal Sta., Baltimore, Md.

Feb. 4-7.—AMERICAN ROAD BUILDERS' ASSOCIATION. Fifteenth annual convention, Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 6-13.—FIRST CHICAGO CEMENT MACHINERY AND BUILDING SHOW. **Supersedes annual Chicago Cement Show. Held at the Coliseum, under direction of the National Exhibition Co.**

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE. Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

"The Engineering Societies"

The United Engineering Society, the Engineering Foundation and the Engineering Council have established a joint suite of offices in the Engineering Societies' Building in New York City, and have engaged as joint secretary Alfred Douglas Flinn, deputy chief engineer of the Board of Water Supply of New York City. The object of this action is economy of administration and development of co-operation between the national organizations of civil, electrical, mechanical and mining engineers, which some years ago formed the United Engineering Society. This society is the holding company for the four founder organizations, is landlord of the Engineering Societies' Building and holds title to the libraries of the society, forming the most important engineering collection in the country. The Engineering Foundation Board is a department of the United Engineering Society, to which is entrusted the administration of the Ambrose Swasey endowment for engineering research. The Engineering Council was organized last summer, having for its purpose "the proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern to engineers."

Mr. Flinn was born in 1869 in New Berlin, Pa., and is a graduate of Worcester Polytechnic Institute He was a member of the engineering staff of the Metropolitan Water Works, Boston, Mass., and a lecturer on water supply and sewerage at Harvard. He then became connected with the New York Board of Water Supply and became department engineer in charge of the headquarters department, entrusted with the construction of the Catskill project. In August, 1914, he became deputy chief engineer of the board.

American Association for the Advancement of Science.

Section D, Engineering, of the American Association for the Advancement of Science, held a number of very interesting meetings at the Pittsburgh convention, December 28 and 29

The Friday morning session was held in Thaw Hall, University of Pittsburgh, and among the papers read were the following:

"The Scientific Principles of Building Codes," J. A. Ferguson, secretary-engineer, building code committee, city of Pittsburgh; "Relative Efficiency of Different Methods of Repairing Bituminous Macadam and Bituminous Concrete Pavements," George H. Biles, second deputy state highway commissioner of Pennsylvania; "The Efficiency of the Application of Cold Bituminous Materials for Surface Treatments on Gravel and Broken Stone Roads," Julius Adler, engineer of tests, Pennsylvania state highway department; "Economic Surfaces for Floors of Steel Truss Highway Bridges, Willis Whited, bridge engineer, Pennsylvania state highway department; "Present Status of Granite Block Pavements," C. D. Pollock, consulting engineer, New York City; "Rattler Tests for Paving Brick of Various Depths," William C. Perkins, chief engineer, The Dunn Wire-Cut Lug Brick Co., Conneaut, O.; "Motor Trucks and Long Distance Highway Transportation," Maurice B. Greenough, chief engineer, National Paving Brick Manufacturers' Association, Cleveland, O.; "The Construction and Maintenance of Highways Under War Conditions," Arthur H. Blanchard, consulting highway engineer, New York City

On Friday afternoon a joint session was held in the Mellon Institute with the Society for the Promotion of Engineering Education Among those who discussed the needs of engineering and engineering education were Henry M. Howe, Bedford Hills, N. Y.; Raymond F. Bacon, director, Mellon Institute; J. B. Garner, Mellon Institute; C. S. Howe, Case School of Applied Science; J. H. James, Carnegie Institute of Technology, and J. R. Withrow, the Ohio State University, and S. R. Church, manager, research department, The Barrett Co., New York City.

The Saturday morning session was held in the Applied Science Building of the Carnegie Institute of Technology. Among the papers presented were: "Conservation of Fuel through Smoke Regulation," by J. W. Henderson, chief, Bureau of Smoke, Pittsburgh; "Housing and Sanitation," by George W. Case, professor of sanitary engineering, University of Pittsburgh, and "The Electrical Safety Work of the Bureau of Standards," by M. G. Lloyd, associate electrical engineer, Bureau of Standards, Washington, D. C.

American Association of State Highway Officials.

The war's effect on road construction was the dominant theme of the annual convention of the American Association of State Highway Officials, held in December in Richmond, Va. The use of highways for war transportation purposes; construction and maintenance of roads under war-time handicaps, and the federal aid law were some of the subjects most discussed.

G. P. Coleman, state highway commissioner of Virginia, president of the association, reviewed the work of the year. Among the most important actions taken by the association were: Recommendation to the Federal Department of Agriculture on the utilization of convict labor on federal aid road construction; help in the preparation of a census, at the request of the War Department, of road machinery and equipment, gravel pits and quarries and other road material and their location; co-operation with the Car Service Committee of the Council of National Defense in the matter of car shortage, transportation of road material and priority order No. 2.

At the afternoon session Charles M. Upham, state highway engineer of Delaware, addressed the association on the subject of car shortage, and Col. William D. Sohier read a paper on military roads.

Roy D. Chapin, vice-president of the Lincoln Highway Association, and chairman of the Highways Transport Committee, renewed the optimism of the officials by predicting the possible revocation of the famous priority order by April.

Logan Waller Page, director, Office of Public Roads and Rural Engineering, led the discussion of federal aid with a paper reviewing the first year's work under this law.

Road design, construction and maintenance of various types, including brick, cement, gravel, macadam and earth formed the subject of Thursday's programs.

Action was taken to request the federal authorities for a more liberal interpretation of the federal aid law so that states in arid regions where important roads are not likely to become post roads for a long time will be able to receive benefit from the law. The state highway departments of the country are to co-operate in the development of a highway war program, which will be turned over to the Highways Transportation Committee and the Priority Board so that the proper transportation of necessary materials may be provided. A committee was appointed to study the regulation of motor vehicles.

Important resolutions were passed, outlining the work of formulating the war program and urging the tremendous importance of adequate highway construction for war purposes; an intensive program of maintenance; convict labor; a campaign of education and publicity, and commending the federal aid law and the appointment of the Highways Transport Committee. The executive committee was urged to take action toward "enlarging the salability of bonds, as road improvement rests in a large measure upon the marketing of state and other municipal bonds."

It was found that thirty-eight states had paid dues last year, twenty of these holding state membership. The dues were raised from $5 to $10 a year for individuals and from $25 to $50 for state members. The following officers were elected: president, W. D. Uhler, Pennsylvania; vice-president, A. R. Hirst, Wisconsin; secretary, Major Joseph Hyde Pratt, North Carolina (absent on military service); acting secretary, A. D. Williams, West Virginia; treasurer, Frank F. Rogers, Michigan. The following form the executive committee: one year, Ira R. Browning, Utah, and Col. E. A. Stevens, New Jersey; two years, M. L. Cunningham, Oklahoma; three years, Paul D. Sargent, Maine, and W. S. Keller, Alabama; four years, Charles F. Stern, California; five years, G. F. Coleman, Virginia. There is one vacancy on the committee, which is to be filled by the executive committee. T. H. MacDonald, Iowa, and H. G. Shirley, Maryland, are hold-over members of the committee.

American Society of Civil Engineers.

An important event in the history of the American Society of Civil Engineers was the removal, on December 7, of the offices of the society from 57th street to the Engineering Societies' Building on 39th street. The officers of the national societies of mechanical, mining and electrical engineers formally welcomed the civil engineers to their new quarters for their respective societies. Dr. Ira N. Hollis spoke for the American Society of Mechanical Engineers, Dr. Rossiter W. Raymond and Adrian L. Saunders for the American Institute of Mining Engineers, and Gano Dunn for the American Institute of Electrical Engineers. George H. Pegram and Dr. George F. Swain responded for the American Society of Civil Engineers.

Nebraska State Association of Commissioners and Supervisors.

The Nebraska State Association of Commissioners and Supervisors held its twenty-third anual meeting at the Castle Hotel, Omaha, December 4, 5 and 6. P. J. Kennedy of York is president; L. R. Barlow of Lodge Pole, vice-president; C. E. Hill of Hastings, secretary, and Mike Cavey of St. Edward, treasurer. Robert E. L. Brooks of Chicago, president of the Cook County

(Continued on page 28)

PERSONALS

Robinson, Charles Mulford, of Rochester, N. Y., the widely known city planning expert, died suddenly from pneumonia in Albany on December 30. Mr. Robinson held the first professorship of civic design in this country, at the University of Illinois. He prepared city plans and acted as consultant for a number of cities, including Denver, Omaha, Colorado Springs, Los Angeles, Columbus, Detroit and in Honolulu He was the first secretary of the American Civic Association, and organizer and first secretary of the National Alliance of Civic Organizations. He was also a member of the City Planning Conference. In October, 1916, he was elected honorary member of the Council for the Town Planning Institute of England, holding one of the only two American honorary memberships. Eleven years ago he was connected with "Municipal Journal" in an editorial capacity. He was author of a number of books and magazine articles on his specialty. Among the former are: "The Improvement of Towns and Cities," "Modern Civic Art," "City Planning," "The Width and Arrangement of Streets" and "The Call of the City." Mr. Robinson was graduated from the University of Rochester in 1891, and was given the degree of M. A. in 1896, the year in which he married.

Russell, L. M., city engineer of Elkhart, Ind., has resigned his position to become associated with Arthur J. Sweet, consulting engineer, Milwaukee, Wis.

Mayor-elect John Galvin, of Cincinnati, O., has announced the following appointments: John R. Holmes, director of public safety; Charles F. Hornberger, director of public service; Newbold L. Pierson, secretary to the mayor.

Mayor Allen B. Clear of Key West, Fla., has made the following appointments: Dr. William R. Warren, city health officer; W. H. Malone, city attorney; E. E. Ingraham, president of the city council; Eugene W. Russell, city auditor; Joseph Pinder, supervisor of registration; J. F. Roberts, meat inspector; Joseph W. Albury, city jailor; engineer city water works, H. C. Wetmore; sanitary inspector, Roland Richardson.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Winfield, Mo., is to build a DRAINAGE SYSTEM, plans being in course of preparation by T. N. Jacob.

STREET IMPROVEMENTS are to be made by Quincy, Fla. The plans for the work were made by the engineers, Burns & McDonnell.

CONCRETE PAVEMENT is proposed for Black River, Wis. The engineer for the improvement is W. F. Baumgartner.

Wiggins, Miss., is to improve its WATER and ELECTRIC LIGHT PLANTS. The city has retained as consulting engineer Xavier A. Kramer.

The SEWERAGE SYSTEM of Union Grove, Wis., is to be improved according to the plans of the city's consulting engineer, W. G. Kirchoffer.

The Kentawka drainage district, Neshoba county, Philadelphia, Miss., in carrying out a number of DRAINAGE PROJECTS, has the consulting engineering services of the firm of Bell & Redding.

PAVING IMPROVEMENTS to be made by Valley Falls, Kan., are being planned by the engineering firm of Black & Veatch.

A WATER SYSTEM is being installed by Bonifay, Fla. Plans and specifications were prepared by the consulting engineering firm J. B. McCrary Company.

Niagara Falls, N. Y., has decided to control its development according to a CITY PLAN. The city has retained as its consulting city planner John Nolen.

Improvements are to be made to the ELECTRIC LIGHT PLANT of Appleton City, Mo. Preliminary plans are now in process of preparation by the engineering firm of W. B. Rollins & Co.

Fremont, Neb., is to build a SEWAGE DISPOSAL PLANT. The city is having plans and specifications for the improvement prepared by the consulting engineering firm of Burns & McDonnell.

INDUSTRIAL NEWS

Cast Iron Pipe.—The trade has accepted the base prices fixed by the Government and manufacturers as fair compared with recent quotations. Judge E. H. Gary, chairman of the Committee on Steel and Steel Products of the American Iron and Steel Institute, recently gave out a statement recommending certain prices for steel and iron products as bases for price fixing and also additional extras and differentials The base for cast iron water pipe is as follows:

"Standard cast iron bell and spigot pipe, 6 inch and larger, class "B" or heavier. Per net ton of 2,000 pounds, without penalty:

$49.00 f. o. b. Birmingham, Ala.
55.35 f. o. b. New York.
54.35 f. o. b. Chicago.

The differentials are as follows:

3 in.	$10.00 over base
4 in.	3.00 over base
Class A or gas pipe	1.00 additional"

It is now expected that business conditions will improve following relief from the depressing effects of impending and delayed price fixing. Chicago prices were reduced $1.15 per ton. Quotations: Chicago, 4-inch, class B and heavier, $57.35; 6-inch, $54.35. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.25. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49.

The Ransome Concrete Machinery Co., 115 Broadway, New York City, announces that the George W. Ziegler Machinery Co. has become its active representative in Pittsburgh, succeeding George W. Ziegler

The Pioneer Asphalt Co., Lawrenceville and Chicago, Ill., announces that on and after February 1, 1918, its general offices will be located at 7323 Woodlawn avenue, Chicago. The company will continue to produce its complete line of bituminous products and asphalts, including paints, pipe coatings, expansion joint, mineral rubber, insulation compound, filter, road asphalt, roofing cement, waterproofing, etc

Argentine Market for Motor Vehicles.

A report on the "Argentine Market for Motor Vehicles" has been published by the Bureau of Foreign and Domestic Commerce as Miscellaneous Series No. 62. It was prepared by David Beecroft as an appendix to the report of the party that was sent to Argentina by the Latin American Return Visit committee. It is issued by the bureau because it deals with a subject of great interest to American manufacturers who are concerned with foreign trade. The writer finds that Argentina offers greater possibilities than any other country in South America as a market for automotive vehicles. The field of the motor truck in Argentina has not been developed to any extent and the truck movement is lagging far behind the car movement. There is a good selling field for trucks in the city of Buenos Aires and a limited field for trucks in cities such as Rosario, Bahia Blanca, Mendoza and Cordoba. In the smaller cities street pavements are generally good, but wide streets are not so common as in Buenos Aires. In addition to outlining the possibilities of selling American cars and tractors, Miscellaneous Series No. 62 has practical pointers on methods of obtaining business and carrying it on successfully. Copies can be obtained at 5 cents from the superintendent of documents, Government Printing Office, Washington, D. C., or from any district or cooperative office of the bureau of foreign and domestic commerce.

The Indiana Truck Corporation, Marion, Ind., recently received a large order from the United States Government for military trucks The president of the corporation, Mr. Charles G. Barley, recently returned from an extended pleasure and business trip to California and the Northwest. Mr. Barley was the guest of Mr. J. N. Clements of the Motor Distributors Company, San Francisco, and Mr. F. W. Vogler, president of the Northwest Auto Company, Portland, Ore. Mr. Barley states that the business of the company is in a flourishing condition and that it has developed remarkably in the past two years.

Work of the Bureau of Standards.

Scientific work of unusual volume and interest is described in the annual report of the director of the Bureau of Standards, just issued. The work ranges from the testing of clinical thermometers to the publication of national electrical and gas codes. Since the war began all branches of this scientific bureau have been conducting researches on technical problems of military application. The regular work, however, has not been overlooked. In fact, the variety and importance of the results obtained during the year in its scientific and technical researches are of unusual interest.

The standardization work has comprised the making of 155,000 tests of weights, measures, measuring instruments, and materials; the promulgation of a new standard screen scale for unifying the sizes of industrial sieves; standardizing blood-counting apparatus, including new specifications based on researches on the errors of such apparatus; the standardization of master scales in 21 states and of the master scales of the American Railway Association, and a large number of special researches in physics of materials.

The report describes much interesting work on standards for electrical measurements; magnetic system of testing steels to ascertain quality for tool making, rail making, ball bearings, and the like; improved methods of light measurement; standard practice codes issued as national standards fo electric service, and for gas service work on standards for street lighting service, and on standards for telephone service; investigation of gas-mantle conditions in the leading cities; and the important work of safeguarding underground structures from the damage caused by stray electric currents.

The chemical work of the bureau included the development of new methods of analyzing steel and other materials; cooperation upon military researches involving chemistry, such as the preparation of special gases, combustion gas detectors; and chemical researches and material testing in great variety and quantity for the government.

The bureau's technologic work comprises a wide range of researches into the special technologies of the metals, cement, clay, clay products, lime, stucco, paints, roofing materials, and miscellaneous materials. The regular growth of the bureau and its special expansion on account of war work has resulted in the construction of several new laboratories and an increase in the staff of about 60 per cent.

NEWS OF THE SOCIETIES

(Continued from page 27)

Real Estate Board, delivered an address Wednesday morning on the value of the Torrens system in Nebraska. George A. Roberts, county clerk of Dawson county, followed with a discussion on what the Torrens system of registration is doing for one Nebraska county. George E. Johnson, state engineer of Nebraska, spoke in the afternoon on county highways and state aid laws. W. M. Sanders, county highway commissioner of Dodge county, discussed state and county cooperation in the matter of highways. Martin Bysong of West Point, commissioner in Cuming county, spoke on the cost of constructing county bridges.

New Jersey Sanitary Association.

The forty-third annual meeting of the New Jersey Sanitary Association was held December 15 at Lakewood, N. J.

A feature of the meeting was an address on "The Civil Surgeon and the National Army," by Major Wells P. Eagleton, Newark, attached to the base hospital at Camp Dix.

Dr. Thomas J. Headley, of the State Agricultural Experiment Station, New Brunswick, spoke on the prevention of the fly nuisance .

The changes in the personnel of officers of the association included the advancement to the presidency of first vice-president George W Fuller, of Summit, succeeding Dr. Calvin N. Kendall, state commissioner of education. Chester H. Wells of Montclair was elected third vice-president and R. B. Fitz-Randolph chosen chairman of the executive committee.

Municipal Journal

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THE DESIGNING OF CONCRETE PAVEMENTS*

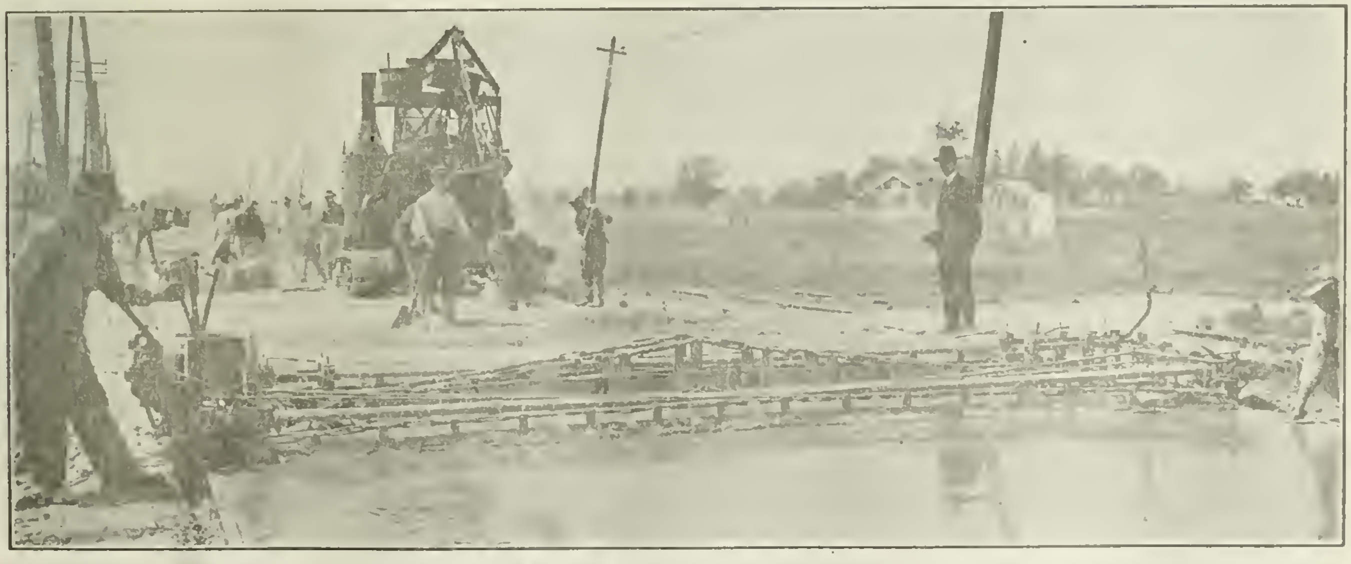
Discussed in the Light of Most Recent Experiences and Investigations—Broken Stone and Gravel—Reinforcement—Jointing Materials—Laying in One or Two Courses—Thickness—Finishing—Shoulders and Ditches.

By CHARLES CARROLL BROWN.

Coarse Aggregate.—Clean, hard, tough, durable crushed rock or gravel is generally specified, graded in size from 1½ inches down in the A. S. M. I. specification, and from 2 inches down in the N. C. C. R. B. specification, not more than 5 per cent to pass the ¼-inch ring in either case. No grading of the coarse aggregate is provided for, except that the A. S. M. I. specification provides that no sizes intermediate between 1½ inches and ¼ inch shall be removed. As in the fine aggregate, proper grading of the sizes produces a mass with smaller percentage of voids, one requiring less mortar to make a homogeneous, uniformly filled concrete, which, if the mortar and stone are non-porous, will produce an impervious concrete.

Broken stone was long considered to be the proper material for concrete road construction, but the less cost of gravel in many places led to its use and it has been demonstrated that, when proper attention is paid to the proportioning of the mixtures to fit the materials used, gravel is an excellent material for use in building concrete roads. Much gravel is of hard, igneous or like rock which stands the wear of traffic much better than the crushed limestone of which broken stone is usually composed. If the gravel is properly graded so that the proportion of large stones is not too great, if the size of the largest stones is restricted to 1½ inches or 2 inches as a maximum limit, if the mixture of gravel and mortar is properly made and laid, the resulting wearing surface is fully equal to one made of broken stone aggregate under similar specifications in other respects, and more durable under traffic. Experience as to the larger pebbles breaking out is conflicting, but it seems that good construction reduces such accidents to a minimum and they occur no oftener than the wearing out of larger soft pieces of broken stone occurs in concrete pavements made with that material.

Gravel particles are very different in shape from broken stone particles, and the grading of sizes in the two materials is very different. There is variation in such grading between samples of stone on account of differences in quality of stone, hardness, stratification, crystallization, etc., and there are great differences in grading of gravel due to the manner in which the gravel was deposited in banks or stream bottoms and the amount of washing necessary; but the standard specifications take no account of these variations aside from the slight restrictions quoted above, the proportion of cement to sand in the mortar and of mortar to coarse aggregate in the concrete being determined by the saturation method and this proportion increased 20 per cent in each case. This is a blanket specification which fits exactly only a small proportion of actual cases and results sometimes in concrete of less than the desired strength and density


AUTOMATIC FINISHING MACHINE ON A CONCRETE ROAD.

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*Concluded from page 10.

and sometimes in concrete which costs more than is necessary. How much can be spent in improving the grading of the aggregates to save money now wasted on excess of cement or to increase the quality of the finished product is the question now under study. As additional information is obtained, cost of concrete roads will be reduced or quality will be improved, either result accruing to the benefit of the concrete road.

Reinforcement.—A steel network used in reinforcing the concrete, if placed fairly near the surface, takes up much of the strain resulting from the shrinkage caused by setting and drying out, and cracks are not so likely to appear. The reinforcement is expensive and is usually accompanied with special care in construction or addition of material to make the concrete water proof. There have been few reports, therefore, as to the action of reinforced concrete pavements under the expansion coming from the absorption of water by thoroughly dried concrete.

The specifications of the American Concrete Institute provide for reinforcement in all pavements 20 feet or more in width at the rate of not less than 28 pounds weight per 100 square feet and spacing between lines of reinforcing not more than 8 inches, to be placed not less than 2 inches from the finished surface of the pavement, and extend within 2 inches of joints, but not cross them. Laps of 4 inches transversely and 1 foot longitudinally are provided for and a reduction of 3 pounds in weight for designs where lap is not required.

Sheets of reinforcing metal of different designs do not keep their positions during deposit of concrete with equal accuracy. Some require different manipulation from others. Thus, one contractor places V-shaped mesh more than 2 inches below the surface, expecting it to work up to the proper level during the working and finishing of the concrete. This difference in action must be allowed for in the design or in the manipulation during construction.

PLACING WIRE MESH REINFORCEMENT.
Municipal force account work in Duluth. Curb not integral with pavement.

Jointing Materials.—If, on further investigation, it is fully determined that expansion and contraction of concrete are largely due to absorption and evaporation of moisture, and only secondarily to the effects of temperature, the resulting attempts to make the concrete waterproof will make joints all but unnecessary, as is claimed for brick pavements. What little porosity remains will usually cause action opposite to that due to temperature and thus reduce expansion and contraction under ordinary conditions almost to zero.

So long as the ideal concrete pavement is in the future, however, the joint will be necessary. It seems to be quite well demonstrated that the best joint is one which will protect the edge of the concrete from wear at the same time that it gives opportunity for motion of slabs at the joints to take up the increase or decrease in their length without crushing the slab at their contact faces or leaving an opening between them to be filled up by dirt, or to let water into the sub-grade or the less dense concrete in the bottom part of the slab.

The standard specifications provide that ¼-inch transverse joints shall be inserted at intervals of not more than 36 feet and ¼-inch to ¾-inch longitudinal joints along the curb when separate curb is used. All joints must extend perpendicular to the surface through the entire thickness of pavement, and the curb also if it is integral. Pre-formed bituminous fillers with fiber matrix are required for transverse joints, but longitudinal joints may be filled by pouring in hot bitumen. Protected joints must have their steel plates thoroughly anchored in the concrete and the plates must be even with each others and with the concrete surface, the plates to be ground off or the whole slab removed and relaid if projecting more than ¼ inch. In unprotected joints the filler must project not less than ½ inch during construction and be cut off to a height of ¼ inch before traffic is admitted.

Several methods of placing joints have been devised which approach more or less closely to the specifications in their results. They can all be used with good results, but some require more time and labor and more attention from the inspector. These will be described in later articles on concrete road construction.

METHODS OF CONSTRUCTION.

Laying in One or Two Courses.—Practice regarding number of courses of concrete is by no means uniform, although there is a tendency toward one course with the claim that more uniform pavements are obtained by this method under present conditions and practices and that the cost is less.

The standard specifications of the American Society of Municipal Improvements provide that for one-course pavement the cement shall fill the voids in the fine aggregate, and the mortar the voids in the coarse aggregate, with 20 per cent excess in each case, the mortar to contain not less than 1 part of cement to 2 parts of fine aggregate gradings of sizes as given above. For two-course work the specifications for the first course are the same as for one-course pavement. Alternative specifications are given for the wearing course. In the first, the coarse aggregate for the wearing surface must be the same as for the first course except that it must pass a ½-inch round opening and not more than 10 per cent shall pass a ¼-inch round opening. The alternative provides that the coarse aggregate shall pass a 1-inch round opening and grade down to ¼-inch, with not more than 5 per cent of material passing the latter. In the base or first course, 10 per cent more cement shall be used than will fill the voids in the fine aggregate and proportions shall not be less than 1 cement to 2½ fine aggregate. Otherwise, and in the wearing surface, the proportions prescribed for the one-course work apply.

Thickness of courses is left to be determined for the particular structure.

Thickness of Concrete.—There are great variations in practice as to thickness of concrete, whether one-course or two-course, running from 4 inches to 12 inches as extremes.

The American Concrete Institute specifications provide that the one-course pavement shall not be less than 6 inches thick at the side and not less than 2 inches thicker at the center. The crown not being less than 1/100 or more than 1/50 of the width, the bottom of the concrete may have no crown if the pavement is less than 20 feet wide, and the tendency of the crown to rise under the expansion due to temperature and to absorption of moisture is thus reduced to a minimum.

For two-course pavement the thickness of lower course at the edge must be not less than 5 inches and the thickness of the wearing course not less than 2 inches, with the additional thickness of 2 inches of pavement at the center.

Finishing.—Either design or inspection of construction are too often at fault with respect to finishing the surface and the joints. Irregular surfaces are no longer necessary. Neither are high joints. Finishing machines and other finishing apparatus are now in use which insure that joint protection or filler and concrete surface shall meet exactly and that the concrete surface shall be uniform, free from hollows and humps and from high joints. The old specifications for hand finishing with wooden floats should be changed to keep pace with modern improvements.

Integral Curb.—It is quite common to prescribe curb integral with the pavement, made of the same concrete and at the same time, sometimes with the reinforcement continued into the curb.

Shoulders.—On highways where curb is not required, well compacted shoulders (of broken stone or gravel, if possible) must be constructed with surfaces uniform with that of the concrete and 4 to 6 feet wide, the transverse surface slope being about 1½ inches to the foot.

Ditches are too often neglected in plans and specifications or they are made too flat and given too little fall to carry off the water. With the conveniently adjustable graders which are now available, there is no excuse for this but neglect or ignorance of the value of ditches with steep enough sides and enough fall to carry the water off promptly and completely.

Alley Pavement.—The principal difference between street and alley pavements is in the surface form. The crown of the road pavement surface is displaced by a depression in the center to which the sides slope uniformly, the depression being not less than 1/50 the width of the pavement and depending upon the longitudinal grade and amount of water to be carried. Longitudinal expansion joints should be placed alongside buildings or masonry structures bordering the alley.

The central depression is sometimes suggested for roads and even for streets, but the difficulty of disposing of the water collecting at the foot of grades and of making street intersections comfortable for traffic almost always prevents this form of street design, though otherwise very desirable.

The thickness of alley pavement is made uniformly 6 inches and reinforcement is seldom required.

Proper Elevation of Curves.—On highways, the California State Highway Commission provides for an elevation of the outer side of curves proportional to the width, the square of the velocity of travel and the radius of curve, not exceeding 1.6 feet for ordinarily sharp curves. The width of the pavement is sometimes increased on sharp curves, as much as one-third in some instances.

SNOW REMOVAL BY STEAM SHOVEL.

A steam shovel has been used with considerable success in Newark, N. J. for loading into wagons the snow which it was decided to remove from the streets following the December storm. The work was done, and we believe suggested, by G. W. Lawrence, a contractor of Newark. Mr. Lawrence writes that he has had five years' experience on snow removal contracts in New York City under both the area system and the cubic yard. He conceived the idea of using a steam shovel when he saw the streets piled high with snow and traffic at a standstill while waiting for a few laborers to dig out the city. On December 7th Mr. Lawrence and his partner, J. F. Chapman, offered to demonstrate to the Newark Street Department the practicability of using steam shovels as a means of relieving the congestion of traffic in the city, which had been almost entirely stopped by the condition of the streets. The shovel used was a No. 3 Keystone Traction shovel with a ⅝ cu. yds. skimmer scoop. Mr. Lawrence says: "This machine with its boom action has, to my mind, the greatest possibilities for snow removal, especially after the snow has been piled in winrows.. Under such conditions it will do the work of at least fifty men. With labor at $3 per day, fifty men equalled $150, and the machine at $45 a day makes quite a difference in cost. The $45 charge on the machine is made up as follows: Engineer, $6 per day straight time; fireman, $3 per day straight time; watchman, $3 per day; coal (soft), $7.50 per day in cold weather; oil, 50c; laborers, $3 per shift; depreciation, $5 per shift; 6 per cent on value of machine, $12 per day; allowance for idle crew and watchman, $4 per day.

"This shovel, with five laborers (who were supplied by the city) cleaning up as the shovel moved, loaded the snow at 17c per cubic yard. The cubic yard price is based on two cubic yards per wagon with the snow piled as high as possible and packed in the wagon. To call this a 3-cubic-yard load I think would not be unfair, which would reduce the price materially. The wagons are the usual type of bottom-dump with built-up sides. The machine would load from 20 to 25 loads per hour if there were sufficient teams. The shovel would not reach its highest efficiency in an unpiled street as too much time is lost in scraping up to get a dipper full. By proper cooperation and compelling the teams to work from 7:00 to 5:00 with an hour for dinner and paying the teams by the load, I am sure snow can be loaded on a piled street for 10c per cubic yard.

Courtesy, Newark Evening News.

STEAM SHOVEL LOADING SNOW IN NEWARK.

"My idea for eliminating the uncertain labor element from snow removal would be to use the road scrapers as soon as two inches have fallen. By making winrows and following with shovels the practice of snow removal would be changed. I was informed that five laborers could load a 4-cubic yard wagon in five minutes. I did not see this feat performed, but my own observation showed about seven or nine men loading a wagon in from fourteen to eighteen minutes; and out of fifty men in a snow gang about 50 per cent are idle more than half the time."

After the shovel had worked four days the contractor was informed that he was no longer wanted, no reasons being given for the decision. He believes, however, that the principle is right and that with a municipality willing to cooperate with the contractor in seeking out the weak spots in the steam shovel method, he is certain that snow can be removed more economically in this way than in any other. He suggests a ⅞ cu. yd. scoop and rope mats made for the driving wheels to protect the pavement. He also says that plenty of teams must be used and kept at work so as to keep the loading cost as low as possible. The average loading time during his test, including moving up, taking water, etc., was two and a half minutes per load; but with a ⅞ cu. yd. scoop he believes this could be reduced to a minute and a half.

STREET CLEANING AND REFUSE DISPOSAL IN CHICAGO*

Local Climatic Conditions Introduce Difficulties—Garbage Decreased During 1917—Dumping Grounds Scarce—Eighteen Trucks for Snow Removal.

By FELIX S. MITCHELL,
Superintendent of Streets, Chicago, Ill.

Due to the lack of funds and the excessive high prices of both labor and material, our bureau has followed the line of least resistance and curtailed expense in every possible way. It has always been our desire to give regular service in the collection of garbage and miscellaneous wastes, but we find this service must suffer with other activities, and collections have been cut to the minimum of one per week where the locality will stand it.

The addition of new apparatus for the cleaning of streets is sadly needed and the additional machinery proposed for next year is four motor squeegees and two motor sweepers. Chicago has never gone into the extensive use of machine brooms or squeegee machines. At the present time we own only two horse-drawn squeegees and no machine brooms. The hand broom supplemented by the auto flusher seems to give us the best results for the least money.

During the last year I have had the pleasure of studying many different methods of disposal of both garbage and miscellaneous waste. I visited Kansas City, St. Louis, Pittsburgh, Baltimore, Philadelphia, Atlantic City, New York, Boston, Buffalo, Detroit, Milwaukee, Springfield, Minneapolis, St. Paul, Des Moines, Montreal, and Toronto. It might seem boastful on my part to make any comparison as to conditions as I saw them in these cities, but I can say without exaggerating that I saw no streets in cleaner or better condition than here in my own city. Many cities are blessed with the sort of climatic conditions and traffic which are a great factor in keeping their highways in a sanitary condition, while Chicago has practically all of the disagreeable factors that favor the opposite.

The winter months in Chicago are especially severe, due to the close proximity to Lake Michigan and so located that east and northeast winds are generally accompanied by blizzards. The continual melting and freezing makes our wood block pavements very slippery and we are compelled to use quantities of rock salt.

The serious problem confronting us at this time is finding dumping grounds for miscellaneous waste, which includes ashes. A short time ago an opportunity presented itself and the city purchased a block of property which contained an old abandoned quarry one hundred feet deep and covering practically the entire block. This hole will serve the surrounding locality for several miles and when filled will be an excellent location for some other public service.

The city also purchased a plot of ground on what is known as "Goose Island." The territory is located in the fork of the north branch of the Chicago river and, besides having dock facilities, is equally well located for railroad service. It is the intention to erect an incinerator for waste and a loading station for garbage at this point.

It might be interesting to note at this time that the high cost of living is plainly visible in the amount and quality of the garbage output. The following table of comparison may furnish interesting data:

Month.	Year 1916 Tons	Year 1917 Tons
January	9,236	7,475
February	7,269	5,478
March	8,357	5,464
April	8,703	5 801
May	10,381	6,802
June	11,848	7,907
July	13,355	10,707
August	15,047	11,975
September	13,845	11,664
October	11,685	10,805

The increase during the summer months shows the effect of green stuffs and the waste naturally coming from green corn, melons, etc.

This year the city purchased four combination road oilers and flushers from the Good Roads Company of Kansas City and, in addition to oiling all macadam streets in the city, we had the machines to put into the service of flushing when not engaged in oiling. We find these machines excellent in every respect and the air compressor is a great improvement over the pump, which was always wearing out in our old street flushers.

The Street Repair Division has a dozen five-ton trucks used in connection with paving and repair work, which, with the six auto flushers, gives us a fleet of eighteen trucks to use on snow removal. All are equipped with plows and in most severe weather this fleet can keep the main thoroughfares free by operating in groups of four or five. The hand broom and shovel gangs remove the snow from the curb line and it is hauled away by carts and trucks to the lake and river. Our snow force always is intact and on one hour's notice can be summoned and the work of cleaning begun. Each gang is assigned to a particular district and each superintendent is responsible for the district assigned to him. Last year in the Loop District 22,894 loads of snow were removed at a cost of 62c. per cubic yard.

POLICE IN PENNSYLVANIA BOROUGHS.

The Bureau of Municipalities of the Pennsylvania Department of Labor and Industry, J. Herman Knisely, chief, has collected statistics concerning the cost of police service in the boroughs of that state that have more than 10,000 population, the size running to 32,000.

The statistics are as follows:

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*Condensed from paper prepared for Society for Street Cleaning and Refuse Disposal.

Police Cost of Boroughs in Pennsylvania Having a Population of Over 10,000.

Borough.	Estimated Population 1917.	No. of Policemen, Including All Officers.	No. of Population Per Policeman.	Total Annual Police Cost.	Annual Police Cost Per Capita of Population.	Annual Wage Cost Per Policeman.
Beaver Falls..	13,748	8	1,718	$ 8,883 00	.65	$1,000
Braddock	22,060	19	1,161	21,500 00	.97	1,155
Bristol	10,826	6	1,804	5,400.00	.50	780
Carlisle	10,791	7	1,542	4,500.00	.42	600
Chambersburg.	12,473	8	1,559	6,268.27	.50	792
Dickson City..	12,530	8	1,566	8,000 00	.61	960
Duquesne	20,647	16	1,290	23,050 00	1 12	1,325
Edwardsville..	10,771	9	1,197	6,960.00	.65	960
Lansford	10,824	3	3,608	2,940 00	.27	960
Latrobe	11,815	5	2,363	8,000.00	.67	900
Lewistown ...	11,148	2	5,574	1,080.00	.15	720
McKees Rocks	20,794	13	1,600	14,000 00	.67	1,050
Mount Carmel	20,709	5	4,142	5,550.00	.27	1,020
Nanticoke	23,810	14	1,701	14,000.00	.59	870
Norristown ..	31,969	19	1,683	33,500.00	1.05	945
North Braddock	15,683	11	1,426	12,510.00	.80	1,200
Olyphant	10,199	3	3,399	3,200 00	.32	1,080
Plymouth	19,439	10	1,944	10,080 00	.52	900
Pottstown ...	16,987	11	1,544	8,000 00	.47	900
Shamokin	21,381	10	2,138	9,240.00	.43	900
Sharon	19,155	12	1,596	16,000 00	.84	1,260
Shenandoah ..	29,109	10	2,911	9,243.00	.32	829
Steelton	15,758	9	1,751	8,360.00	.53	900
Sunbury	16,661	5	3,332	3,660 00	.22	780
Tamaqua	11,062	2	5,531	2,300.00	.21	960
Taylor	12,563	6	2,094	6,000 00	.48	960
Warren	15,337	7	2,191	7,700 00	.51	900 to 1,050
Washington ..	22,075	11	2,007	11,200.00	.51	900
West Chester..	13,403	12	1,117	9,200 00	.69	840
Wilkinsburg ..	23,928	14	1,709	17,062.00	.71	1,225

An examination of these figures reveals no apparent relation between size of borough and either population per policeman or police cost per capita.

THE CONSTRUCTION AND MAINTENANCE OF HIGHWAYS UNDER WAR CONDITIONS*

Development of Motor Truck Transportation—Transporting Highway Materials and Machinery—Contracts and Labor—Military Trunk Highways.

By ARTHUR H. BLANCHARD.†

Statements by highway officials, the influence of United States Government priority orders, the high prices of labor and highway materials, unjustifiable requirements in contracts and specifications placing all war-time risks on the shoulders of contracors, and public opinion that highways should be classed as luxuries, have combined to curtail the improvement of highways throughout the United States.

Development of Motor Truck Transportation Under War Conditions.—Since the United States entered the War, however, motor truck transportation on country highways has developed rapidly due to the following causes: First, the marked increase in tonnage and bulk of shipments; second, the lack of railroad equipment to efficiently handle freight and express transportation; third, the inadequacy of railroad terminal facilities; fourth, the United States Government priority orders; and fifth, the intensified consideration of economic problems, the solution of which would lower prices of the necessities of life. Due to the above conditions, transportation by motor trucks is developing along the following lines:

Available cost and operation records and the opinions of users of motor trucks on long hauls lead to the conclusion that, granted good roads and efficient management, the transportation of industrial and agricultural products on hauls of fifty to seventy-five miles is economical under peace as well as war conditions. Motor truck transportation for distances in excess of seventy-five miles will be found to be economical under certain conditions. Under war conditions excessive long haul transportation will be developed to a large extent.

Incident to the general development noted, is the progressive establishment of express motor truck transportation companies, several of the pioneers being in operation in the State of New York four or five years ago. One of the most widely advertised companies is operated by the Goodyear Tire & Rubber Company between Akron, Ohio and Boston, the round trip of 1,510 miles being made in less than one week. Another prominent company, the Beam-Fletcher Corporation, operates a daily motor truck service between Philadelphia and New York and guarantees deliveries in New York by noon of goods received not later than 5 P. M. on the preceding day in Philadelphia.

Another special field in which motor truck transportation is developing is found in areas surrounding railroad centers. Under peace and war conditions, it is economical, granting good cross-country highways and efficient management of motor truck companies, to transport freight consigned to a town on one railway line entering the terminus from a town located on another radiating railroad. Under war conditions, at least, the railroads will welcome such development of motor truck transportation, as freight cars are thus saved for long hauls and the congestion of freight yards relieved.

Under war conditions, railroad freight haulage by motor trucks over highways paralleling railways may, in some cases, become mandatory in order to relieve the congestion of terminals and increase the monthly ton-mileage of freight cars. By increasing unloading facilities at railroad stations on lines entering a city, many classes of freight consigned to the terminus could be transferred to motor trucks and thus delivered to the consignees.

If the food problem is partially solved by the establishment of city public markets supplied by motor trucks direct from farms, motor truck traffic will increase enormously on many highways entering cities. In Congress there is already under consideration a bill to establish postal motor truck routes on which farm produce would be collected for delivery, not to retailers, but direct to city homes.

Highway Improvement Under War Conditions. It is evident, therefore, that transportation by motor trucks will develop rapidly under war conditions, and that highways of inter and intra-state transportation systems must be improved if agricultural, industrial and commercial activities, necessary for the successful conduct of the war, are to be efficiently maintained.

Granted the economic necessity of a vigorous highway improvement campaign, a program must be outlined under which the improvement of many highways may be carried on expeditiously and at a minimum cost under war conditions. Excellent educational and productive work has already been started by the Highways Transport Committee of the Council of National Defense, the United States Office of Public Roads, the American Association of State Highway Officials, local highway organizations, and the technical and daily press. The following suggestions do not constitute a complete program of procedure but are presented for consideration and discussion as factors in constructing and maintaining highways under war conditions.

Transportation of Highway Materials and Machinery. It is evident that it will be necessary for states, counties, towns and contractors to use motor trucks under all practicable conditions for the transportation of highway materials and machinery. In order that the utilization of motor trucks on country highways may be economical and efficient, it is highly desirable that some agency should acquire all reliable data pertaining to haulage by motor trucks on country highways under varying conditions and give wide publication to all data of value to users of motor trucks.

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*Presented before Section D of the American Association for the Advancement of Science on December 28, 1917.

†Consulting Highway Engineer, New York City.

Granted ideal improvement of highways for use by motor trucks, efficient operation will be impracticable if traffic regulations are not based on sound economic principles. Furthermore, the economic use by motor trucks of inter-state trunk highways will be difficult if each state continues to enforce laws radically different from adjoining states. For example, the Beam-Fletcher Corporation of Philadelphia, which operates a daily motor truck express service between Philadelphia and New York, states that "New Jersey's new motor vehicle law reducing speed of trucks to ten miles per hour with sealed governor, will, if enforced, make it impracticable for us to continue operation east of Pennsylvania after January 1st."

Investigations made in the State of New York showed that the average speed of motor trucks carrying a load of one ton was about 19½ miles; carrying from two to five tons, about 17½ to 14 miles, respectively; and carrying fifteen tons, 10 miles per hour. The investigation also showed that 65 per cent of the motor trucks using highways outside of cities carried loads varying from two to five tons. It is evident, based upon the statistics, that a maximum speed regulation of 10 miles per hour would mean a material reduction in the present average speed and, in most cases, the impracticability of using motor trucks economically for transportation purposes on long hauls.

Not until the effects of the normal operation of motor trucks on efficiently improved roadways have been established, should maximum speeds of less than 20 miles per hour for trucks carrying loads up to three tons and 15 miles for trucks carrying over three tons be incorporated in traffic regulations. Neither should unwarranted restrictions be imposed relative to over-all dimensions of motor trucks and the use of one, two or three trailers.

The more general utilization by motor trucks of inter-state highways controlled by radically different state traffic regulations will add the users of motor trucks to the multitude of touring car owners who demand the enactment of uniform state traffic regulations or a national traffic law. The value of inter-state trunk highways to the nation, as emphasized by war conditions, points to the spring of 1918 as a most opportune time for representatives of our state legislatures to meet in conference and adopt uniform traffic regulations.

Contracts, Specifications, and Details of Construction.—Contracts and specifications must be simplified, otherwise it will not be practicable to secure bids from responsible contractors. It would be advisable if the American Association of State Highway Officials should adopt, as far as practicable, simple, uniform, general requrements of contracts and specifications which would reduce to a minimum the burdens now placed on contractors, retaining only such stipulations as are necessary to insure honest work under competent supervision. Special attention should be given to the following subjects: The elimination of maximum prices in bid sheets; the insertion of definite requirements covering materials so that contractors may determine on the source of supply before bids are submitted; elimination as far as practicable of the use of the objectionable phrase "to the satisfaction of the engineer"; elimination of clauses which make contractors assume the financial loss caused by rectification of mistakes in designs and specifications.

State highway laws should be so modified as to permit of any piece of construction or maintenance work being undertaken by the state, county or town acting as the contractor when conditions render such a method expedient.

State contracts should be awarded to experienced contractors only, and the work should be let to the lowest bidder, the proposal being based on a cost plus a profit on labor and rental of equipment, all highway materials being furnished at designated localities by the state. Under this arrangement, inexperienced contractors should be allowed to work as sub-contractors. Under the direction of the writer while deputy engineer to the State Board of Public Roads of Rhode Island, a slight modification of this method was successfully developed in connection with the construction of bituminous concrete pavements. The experienced contractor will be able to take work under these conditions at the minimum cost and at the same time make a reasonable profit. It should be recognized as a fundamental principle of contractors' bids on public work that the experienced contractor endeavors to protect himself by allowances for uncertainties in market conditions, requirements of specifications and contracts, and the execution of the work under the supervision of inspectors and higher members of the engineering staff.

Making use of local materials for the construction of highways has always been advocated. In the consideration of methods of highway improvement special attention should be paid to devising suitable methods which will require minimum tonnage and bulk transportation of highway materials. Maximum use must be made of deposits of sand, gravel and rock. This necessity will lead to the development of many local deposits from which the materials may be transported by motor trucks.

Labor Under War Conditions.—Methods should be adopted that will require the minimum amount of common and skilled labor. In conjunction with this recommendation, its correlation should be considered, namely, the maximum use of labor-saving machinery in all methods of construction and maintenance.

All states should use convict labor to the maximum extent of the availability of such labor. The mooted question of economical use of convict labor and competion with organized labor are eliminated due to war conditions.

Able-bodied prisoners of war that are not being utilized in foreign countries might be transferred to the United States and assigned by the Government, under military supervision, to highway work under state departments.

Military and Inter-State Trunk Highways.—The discussion of military highways leading to cantonments, fortifications and Government arsenals will be limited to expressing the opinion, based on the established principles of economics of highway improvement, that the United States Government should assume control of such highways and the entire cost of construction and maintenance.

The development of motor travel and motor truck transportation has vividly drawn attention to the relative values of different classes of highways to the nation, state, county and urban districts. Public opinion is slowly but surely tending towards the conclusion, held by many individuals and associations, that inter-state trunk highways should be constructed and maintained by the National Government. Under war conditions, such action by the Government is a military and public welfare necessity. It is possible, by this method, to have the vital trunk highways of the nation designed, constructed, maintained and regulated so that their utilization for motor truck transportation under war conditions will be economically practicable.

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MOTOR TRUCKS ON MAIL ROUTES.

The extensive use of motor trucks for relieving the railroads in hauling freight and for reaching points not accessible by rail, which we have advocated several times during the past two months, is increasing rapidly under the encouragement of the Federal government as well as because of the realization of the economy and other advantages to private individuals.

The latest development is probably that announced by the post office department, which is preparing to use motor trucks on parcel-post routes. Within perhaps the next three months such routes will be in operation to the extent of 3,000 to 4,000 miles, the several routes varying in length from 50 to 150 miles each. One chain of routes will extend from Portland, Me., to New Orleans; another will cover much of a large stretch of territory in Ohio, Indiana, Illinois and West Virginia; while on the Pacific coast routes will be established between San Francisco and Sacramento and between Redlands and Los Angeles. This development by the post office department appears to be largely with a view to aiding in the distribution of food products and thereby lowering the cost of food to consumers. The post office will designate the routes upon which trucks must be used, and the hauling will be given out by contract unless the price is excessive, in which case the government will operate the service itself.

It has been the practice of that department to discontinue mail routes where the roads are not kept in passable condition, and this action would seem to render it necessary that these 3,000 or 4,000 miles be kept in such condition continuously that motor trucks can use them without difficulty.

Another indication of the rapid realization of the advantages of motor truck service in relieving the railroads, and of the probability of the extension of such service, is found in the papers presented before Section D at the recent convention of the American Association for the Advancement of Science. The majority of these papers dealt with paving and highway matters generally, and two of them laid special emphasis upon the necessity for providing for an enormous development of motor truck hauling, while several of the others made reference to the same matter.

Present indications are that the use of motor trucks this year will be limited only by the ability of manufacturers to turn out the trucks. The government is calling for thousands of them for army use, the automobile manufacturers are being relied upon to deliver aeroplanes by the tens of thousands within the next six months, and with this additional demand for trucks for carrying ordinary commercial freight, it looks as though the amount of work to be done by the automobile manufacturers this year will be exceeded only by that of munition manufacturers.

As we have said before, however, the point which needs special emphasis in a municipal paper is the necessity for preparing the streets and highways for carrying this enormous increase in volume and weight of truck traffic and maintaining them continuously in such condition. It is none too soon to begin today planning for the inauguration of such work as soon as the weather permits. There are some who predict that even in the northern states winter will have departed and spring be on us within eight weeks. Before such time arrives, every road official should have in the best possible condition all the machinery necessary for an active campaign of road construction and repair, and should have arranged so far as possible for supplying upon the highway the materials required in such work. Sand, gravel and broken stone can, in many districts, be hauled more cheaply by sleigh over the snow-covered roads than will be possible by wagons or trucks after the snow has disappeared and the frost has rendered the roads rough and in some cases almost impassable. And such material so hauled can be piled along the roadside ready for use at the first available moment.

AUXILIARY FIRE EQUIPMENT.

In the issue of Municipal Journal for October 25 and the several issues since then, there have appeared tables giving data concerning fire department methods and equipment in several hundred cities throughout the country. In this issue we present the first half of the last of these tables, the remainder of which will be given next week. This gives the amount of auxiliary equipment in the several cities, classified under the general heads of lung motors or pulmotors, oxygen helmets, search lights, hand extinguishers, feet of hose, and number of tires, solid or pneumatic. It also gives the type of fire alarm system employed in the several cities.

A number of cities replied that their system consisted of a whistle, siren, or other form of alarm. This, of course, is not just the information which we aimed to ask for, what we desired to learn being rather the method employed for notifying the fire department of the existence of a fire rather than that employed by the department for notifying the public or the volunteer or call force. In a previous special annual issue dealing with fire matters we gave data which told, for each city, whether alarms were "still" or were made public by the use of a bell, whistle, etc.

It will be interesting to compare the amount of hose on hand with the population of each city, or the amount of fire apparatus using hose; figures for both of which will be found in the preceding tables.

AUXILIARY FIRE EQUIPMENT.

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extin-guishers	Solid Tires	Pneu-matic Tires	Feet of Hose	Type of Alarm System
Alabama:								
Brewton	..	..	..	..	..	..	2,200	Phone
Gadsden	..	6	2	4	4	..	4,000	Phone
Huntsville	..	2	2	4	..	..	5,500	Phone
Selma	..	..	..	10	1	1	5,000	Gamewell
Arizona:								
Bisbee	..	..	1	8	..	..	9,000	Gamewell
Douglas	..	..	3	6	..	..	3,700	Gamewell
Nogales	..	..	1	12	..	..	2,200	....
Phoenix	..	2	3	15	..	..	6,300	Gamewell
Arkansas:								
El Dorado	..	..	1	4	..	..	2,000	Phone
Fort Smith	1	1	2	14	1	2	12,000	Phone
Jonesboro	..	..	..	4	..	..	2,500	Phone
Little Rock	1[1]	2	..	25	32	20	14,000	Gamewell
Prescott	..	..	2	2	..	..	1,500	....
Russellville	..	..	..	..	..	..	2,400	General
California:								
Alameda	..	2	5	18	..	1	9,050	Gamewell
Berkeley	1	3	..	32	..	..	14,600	Gamewell
Bishop	..	..	1	..	6	..	1,600	....
Coalinga	..	..	1	4	..	..	2,500	Gamewell
Emeryville	..	..	2	6	..	10	2 500	Gamewell
Hayward	..	2	1	23	..	4	2,100	Gamewell
Long Beach	1	4	1	19	..	1	3 000	Gamewell
Modesto	1	..	2	4	4	4	3,500	Gamewell
Monrovia	..	..	1	9	..	..	2,000	Whistle Phone
Oakland	2	10	2	60	40	..	45 000	Gamewell
Palo Alto	..	2	1	12	..	..	3,000	Gamewell
Pasadena	1	..	..	40	..	..	15,000	Gamewell
Petaluma	1	..	4	8	..	..	5,500	Gamewell
Pomona	..	..	3	6	13	4	2,400	Phone
Redlands	..	..	2	8	8	..	3,150	Electric Tapper
Richmond	1	1	..	..	..	..	15,000	Gamewell
San Leandro	..	..	..	..	..	..	2,000	....
San Rafael	..	..	..	10	..	1	3,500	Gamewell
Santa Ana	..	1	3	8	8	..	5,000	Signal Phone
Santa Barbara	..	..	1	7	..	..	3,000	Gamewell
Santa Monica	1	..	3	..	..	..	5 000	Gamewell
Santa Rosa	..	1	..	6	..	3	3,850	Gamewell
Stockton	..	2	..	2	..	..	24,500	Gamewell
Ventura	..	..	3	6	..	..	1,800	....
Watsonville	..	..	..	4	..	..	3,000	Star
Whittier	..	2	1	4	4	..	1,250	Phone
Colorado:								
Boulder	..	..	1	6	..	2	6,000	Gamewell
Colorado Springs	1	3	..	16	16	28	12,000	Gamewell
Ft. Collins	..	..	1	4	6	..	3 000	Gamewell
Grand Junction	1	..	3	6	4	4	3,600	Phone
Idaho Springs	..	..	..	..	..	..	3 500	Gamewell
Longmont	..	1[2]	1	..	..	5	2 400	Siren
Trinidad	..	1	3	12	4	..	4,200	Gamewell
Salida	..	..	2	2	..	6	1,950	Gamewell
Connecticut:								
Bridgeport	3	5	3	60	..	12	22 200	Gamewell
Danbury	..	..	2	20	4	5	12,500	Gamewell
Greenwich	..	..	2	16	..	..	4,500	Gamewell
Hartford	1	8	..	45	20	34	37 935	Gamewell
New Britain	1	2	..	14	..	..	10 500	Gamewell
New Haven	1	2	4	50	..	..	30,000	Gamewell
Norwich	..	..	..	..	..	..	11,050	....
South Manchester	1	..	5	16	6	2	7 000	Gamewell
Stratford	1	2	2	6	..	3	2,500	Phone
Suffield	..	..	1	12	..	..	2 400	....
Torrington	1	..	1	30	..	..	3,000	Gamewell
Waterbury	1	3	..	32	..	..	14 000	Gamewell
Wethersfield	..	..	1	2	..	..	1,000	....

AUXILIARY FIRE EQUIPMENT (Continued).

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extin-guishers	Solid Tires	Pneu-matic Tires	Feet of Hose	Type of Alarm System
Plymouth	..	..	..	..	..	..	2,500	Gamewell
Portland	..	..	1	6	..	..	2,000	Phone
Richmond	..	..	6	..	..	..	8,000	Gamewell
Shelbyville	1	..	1	8	..	10	4,000	Gamewell
Sullivan	..	..	..	2	..	..	1 800	Phone
Terre Haute	..	8	14	28	10	9	20 000	Gamewell
Vincennes	..	1	..	11	..	14	3,500	Gamewell
Wabash	..	1	1	6	1	..	3,800	Gamewell
Warsaw	3	..	1	2	2	..	3 000	Phone
Washington	..	..	2	6	4	..	3,000	Gamewell
Whiting	1	..	1	2	..	1	3,000	Gamewell
Iowa:								
Burlington	..	..	..	..	..	..	10,000	Gamewell
Cedar Rapids	1	1	4	16	4	..	9,000	Gamewell
Council Bluffs	..	..	..	12	..	..	15,000	Gamewell
Davenport	..	2	6	12	42	5	18,625	Gamewell
Denison	1	1	..	2	..	..	1,800	Bell and Siren
Fairfield	..	..	1	3	..	..	2,000	Phone
Grinnell	1	1	2	6	1	..	3,000	Whistle and Phone
Keokuk	1	1	1	2	8		6,000	Box and Phone
Le Mars	..	..	..	..	..	..	4,000	Whistle and Phone
Marion	..	..	..	4	..	..	3,000	Phone
Mason City	1	2	1	8	..	..	2,000	....
Muscatine	1	1	..	3	..	..	6,500	....
New Hampton	..	..	..	..	..	..	1,400	Bell and Siren
Oelwein	1	1	1	2	..	1	2 500	Phone
Sioux City	1	1	..	..	..	..	16,500	Gamewell
Washington	..	..	1	7	4	..	2,500	Phone and Bell
Waterloo	1	2	..	..	..	..	8,000	Gamewell
Kansas:								
Cherryvale	..	..	..	2	..	5	1,800	Phone
Fredonia	1	2	1	6	..	10	900	Phone
Holton	..	..	..	..	..	..	1,300	....
Independence	..	1	3	5	1	..	2,500	Phone
Kansas City	1	2	5	22	1	12	20,000	Phone
Mulberry	1	..	..	..	..	..	1 000	Whistle
Newton	..	..	2	4	..	..	2 000	Phone
Olathe	1	..	1	4	..	..	2 500	Phone
Ottawa	..	..	..	6	..	..	2 200	Phone
Parsons	1	..	3	7	2	..	4,500	Gamewell
Topeka	1	2	..	13	..	..	11,500	Gamewell
Kentucky:								
Cynthiana	..	..	1	2	..	..	3 000	Phone
Harrodsburg	..	..	..	1	1	..	1,600	....
Henderson	..	..	1	5	4	5	6,000	Gamewell
Hopkinsville	..	..	2	..	..	..	3,000	Phone
Lexington	1	..	2	10	8	1	14,000	Gamewell
Richmond	..	..	1	2	..	..	1,500	Phone
Russellville	..	..	..	6	..	..	1,200	Whistle
Louisiana:								
Jennings	..	..	..	.	..	..	1,500	Phone
New Orleans	2	..	2	42	..	..	51,559	Gamewell
Winnfield	..	..	..	2	..	..	3,000	Phone
Maine:								
Augusta	..	..	1	20	..	9	750	Gamewell
Biddeford	..	2	1	10	..	..	10,000	Gamewell
Calais	..	..	..	6	..	..	6 000	Gamewell
Camden	..	..	..	3	..	..	6,000	Gamewell
Dexter	..	..	1	3	..	..	3,400	Gamewell
Hallowell	..	..	..	10	..	..	1,000	Phone
Kennebunk	..	..	..	10	..	..	3 000	Gamewell
Norway	..	..	..	14	..	..	3 100	Stevens
Portland	2	..	2	42	..	..	38 000	Gamewell
Rumford	1	..	1	12	4	6	6,000	Gamewell
Skowhegan	..	..	1	8	..	..	4,500	Gamewell

Dist. of Columbia:								
Washington	..	6	33	160	..	9	109,500	Gamewell
Florida:								
Daytona	2	2[3]	1	5	..	..	4,000	Loper
Lakeland	1	..	1	6	2	..	3.800	Gamewell
Plant City	..	..	..	..	..	..	1.650	....
Quincy	..	..	1	6	1	..	3,700	Gamewell
St. Augustine	..	..	..	4	..	..	5.000	Phone
St. Petersburg	1	..	1	..	..	..	6,500	Gamewell
Sarasota	..	..	..	7	7	..	3,600	Phone
W. Tampa	..	..	2	5	1	1	4,000	Phone
Georgia:								
Americus	..	..	3	8	14	..	5,400	Gamewell
Athens	..	..	2	7	2	..	5.600	Gamewell
Atlanta	1	1	..	30	..	..	32,000	Gamewell
Brunswick	..	..	1	8	6	2	4.500	Gamewell
Carrollton	..	..	3	5	..	9	2 500	Gamewell
Douglas	..	4	1	2	..	..	2,000	Whistle
Moultrie	..	..	..	..	1	..	3,400	....
Newnan	..	..	2	4	..	..	2,900	Gamewell
Rome	1	..	3	12	2	4	8,000	Gamewell
Valdosta	..	1[2]	2	4	..	..	4,900	Gamewell
Idaho:								
Boise	..	..	..	..	..	..	6,850	Gamewell
Pocatello	1	1	3	7	..	..	5,000	Gamewell
Illinois:								
Aurora	..	..	..	12	..	..	8,000	Gamewell
Belvidere	1	2	2	7	..	..	4.000	Phone
Bloomington	..	2	..	..	4	1	7,000	Gamewell
Cairo	1	..	1	6	4	4	3,800	Phone
Carrollton	..	..	..	4	..	..	800	Bell
Cartersville	..	..	2	7	..	..	1,000	Bell
Champaign	1	1	5	8	..	..	350	Phone
Charleston	..	..	1	..	..	..	1 500	Phone
Chester	..	..	1	6	..	..	1.500	Siren
Chicago	3	34	2	249	..	..	340,889	Revised Gamewell
Chicago Heights	..	1	4	6	..	..	4,000	Gamewell
Downers Grove	..	..	..	..	..	..	1,200	....
Du Quoin	..	..	..	..	..	..	1.000	....
Dwight	..	1	..	2	..	..	1.250	Bell
E. Moline	..	..	..	3	4	..	1 500	Phone
E. St. Louis	..	..	1	4	4	8	15.500	Gamewell
Elgin	1	1	3	11	3	1	5,200	Gamewell
Evanston	1	2	1	15	1	1	7,500	Gamewell
Granite City	..	..	2	5	..	..	2.500	Phone
Highland	..	..	1	4	1	..	1,800	Whistle
Jacksonville	..	..	2	7	..	..	5 000	Gamewell
Joliet	1	1	6	10	4	4	8.500	Gamewell
Macomb	..	..	2	4	..	..	1 800	Bunnell
Murphysboro	1	..	1	..	..	12	2 500	Phone
Marshall	..	..	..	..	..	..	1,300	....
Normal	..	1	..	2	..	..	1 600	Gamewell
Pana	1	..	..	4	..	..	3 600	Gamewell
Paris	1	..	1	3	..	..	2 700	Phone
Paxton	..	..	1	6	4	4	2 000	Whistle
Pekin	1	..	1	6	10	..	3,350	Gamewell
Robinson	..	..	..	..	..	..	1,800	Phone
Waukegan	..	..	..	..	..	..	3.500	Gamewell
Witt	1	..	1	..	4	..	1.600	Bell
Woodstock	..	1	2	2	..	..	1,000	....
Indiana:								
Anderson	1	..	..	.	..	..	6,500	Gamewell
Bloomfield	..	..	..	..	..	..	600	....
Decatur	1	..	2	10	..	4	2.500	Phone
Elkhart	..	..	5	10	12	10	7 000	Gamewell
Frankfort	1	..	5	5	..	11	2 250	Phone
Garrett	..	..	..	3	4	..	1.000	Phone
Gary	..	..	..	..	..	..	18,000	Phone
Jasper	..	..	..	..	..	..	1,500	Bell and Whistle
Kendallville	..	..	4	6	1	..	2.600	Gamewell
Kokomo	..	4	..	76	16	4	6 000	Gamewell
Lafayette	..	..	..	15	..	3	8 000	Gamewell
LaPorte	..	..	..	10	16	4	6 000	Gamewell
Lawrenceburg	..	..	..	..	..	..	3,800	Phone
Martinsdale	..	..	..	2	..	1	1,800	Phone
Maryland:								
Baltimore	1	4	..	70	92	14	133,875	Gamewell
Massachusetts:								
Adams	..	..	3	7	..	..	5,800	Gamewell
Belmont	..	..	..	10	2	..	3,500	Gamewell
Beverly	1	..	3	24	..	..	14,000	Gamewell
Brockton	1	2	2	35	2	7	15,700	Gamewell
Cambridge	1	..	..	32	..	..	18,000	Gamewell
Dedham	1	..	2	20	..	..	6,000	Gamewell
Fitchburg	..	..	..	22	..	..	16.000	Gamewell
Foxboro	..	..	1	20	..	..	3,000	Gamewell
Framingham	..	..	..	10	..	2	8,000	Gamewell
Gardner	..	2	8	34	3	1	8,500	Gamewell
Gloucester	..	..	..	26	..	..	27.000	Gamewell
Greenfield	1	..	3	..	..	..	8,000	Gamewell
Haverhill	..	3	2[4]	15	2	5	12 000	Gamewell
Hingham	1	..	2	25	..	..	5.000	Gamewell
Lawrence	1	..	..	40	..	..	22,000	Gamewell
Lowell	2[1]	2	..	24	..	..	.....	Gamewell
Ludlow	1	..	1	..	..	..	3,000	Gamewell
Lynn	..	..	..	36	80	22	18,000	Gamewell
Malden	..	1	..	..	10	10	7,000	Gamewell
Marblehead	..	..	3	8	20	..	9,000	Gamewell
Middleboro	1	..	..	12	..	..	6.000	Gamewell
Milton	..	..	1	20	..	..	7,000	Gamewell
New Bedford	..	2	4	36	..	8	21,000	Gamewell
North Andover	..	..	..	10	..	1	4,000	Gamewell
North Brookfield	..	..	1	14	..	..	3,000	Whistle and Phone
North Easton	..	..	1	36	..	4	2.700	Gamewell
Orange	1	..	14	22	..	..	7.800	Gamewell
Peabody	1	2	6	24	..	..	15.000	Gamewell
Quincy	..	..	..	30	2	2	1.500	Gamewell
Reading	..	..	..	13	..	..	6,500	Stevens and Gamewell
Revere	..	..	6	18	3	3	8.500	Gamewell
Salem	..	2	..	17	..	..	16,000	Gamewell
Somerville	2	14	3	15	..	..	10,000	Gamewell
Spencer	..	..	..	..	..	..	6,000	Gamewell
Taunton	1	..	..	36	16	21	14,000	Gamewell
Walpole	1	..	3	25	..	..	4,000	Gamewell
Waltham	..	3	3	28	4	1	9,500	Gamewell
Ware	..	..	2	10	2	2	3.500	Gamewell
Watertown	..	2	..	12	..	2	4,500	Gamewell
Wellesley	1	1	3	13	..	..	8.000	Gamewell
Westford	..	..	..	130	..	..	3,800	....
Winthrop	1	..	..	..	..	..	6,000	Gamewell
Worcester	..	..	..	..	..	..	36,000	Gamewell
Michigan:								
Albion	..	..	1	6	..	..	3.500	Phone
Alpena	1	..	1	5	..	..	7,000	Phone
Ann Arbor	..	..	2	..	..	..	6.000	Phone
Battle Creek	1	2	1	22	..	..	12,000	Gamewell
Belding	1	..	1	2	..	..	2,000	Phone
Cadillac	1	..	1	4	..	..	55,000	Gamewell
Detroit	6	3	17	150	..	..	108,155	Gamewell
E. Jordan	..	..	2	6	..	..	2,500	Whistle and Phone
Grand Haven	1	2	1	2	..	..	4 500	Gamewell
Greenville	1	..	..	5	..	..	3 000	Phone
Hillsdale	..	..	..	4	..	..	2,900	Phone
Holland	1	..	1	10	..	..	7.000	Gamewell
Iron Mountain	..	..	1	..	6	..	3.600	Duplex
Lapeer	..	..	..	4	..	1	2.800	Phone
Manistee	1	..	4	6	4	..	7,500	Gamewell, Star, Detroit
Marquette	1	2	..	8	..	..	5,000	Gamewell
Pontiac	1	1	..	8	2	1	5,100	Gamewell
Wyandotte	1	..	2	4	..	..	5,000	Gamewell
Minnesota:								
Albert Lea	..	..	4	4	..	..	3.100	Phone
Anoka	..	..	1	..	..	..	4.500	....
Bemidji	..	..	2	12	4	..	2 000	Phone
Chisholm	..	..	1	8	4	..	7.500	Gamewell
Cloquet	1	..	..	4	4	..	3,750	Gamewell

[1] Owned by police department; [2] smoke filters; [3] smoke masks; [4] on cars; [5] mounted on water towers; [6] on each; [7] own installation; [8] Star repeater and switchboard with both Star and Gamewell boxes.

The WEEK'S NEWS

Federal Aid for All States Now—Trenton's Road Tax Tangle Continues—War Effect on Washington's Highway Program—Road Building Education in West Virginia—Savannah's New Sewerage System—New York Health Department May Sell Milk—Gas Company Must Extend in Unprofitable Territory—"Readiness-to-Serve" Charge Approved by New Jersey Commission—Fires in Nation-wide Epidemic—Commission Form Wins in Two More Cities—New York Laborers May Get Wage Increase.

ROADS AND PAVEMENTS

All States Receiving Federal Aid.

Washington, D. C.—All the states of the Union have availed themselves of the opportunity of participating in the benefits of the Federal aid road act, which appropriated $75,000,000 for the construction of post roads and $10,000,000 for forest roads, according to the report of the director of the Office of Public Roads and Rural Engineering, United States Department of Agriculture. That the passage of the act has stimulated road building is shown by the fact that in 1916 there were approximately $41,000,000 of state funds expended for all highway purposes, and it is estimated that in the calendar year 1917 the aggregate expenditures of state funds for this purpose will be at least $60,000,000. A number of the states have made specific appropriations to meet Federal aid dollar for dollar. Among these are New York, Illinois, Michigan, Rhode Island, Nevada, Iowa, Florida and Vermont.

State Buys "First Paved Road in America."

Harrisburg, Pa.—The section of the Old York Road, extending from Philadelphia city line to about a mile north of Hatboro, Bucks County, has been acquired by the state highway department at a cost of $105,000, which includes the various toll-house properties along the turnpike. The records concerning this highway date back to the days before the Revolutionary War. Old records show that on June 27, 1693, a petition was presented to the governor and his council by the inhabitants of Cheltenham, in Philadelphia County, "for a convenient road to the town of Philadelphia." According to the minutes of the council, August 8 and 9, 1693, "The first artificial road ever constructed in America was on a portion of this highway and was constructed of logs and planks." In 1894, when trolley tracks were laid, some of these logs and planks were unearthed.

Jersey Road Tax Decision May Be Appealed.

Trenton, N. J.—That the final decision of the Edge road tax act controversy has not yet been reached is indicated by George L. Record in a statement on the Supreme Court's decision upholding this road tax act. Mr. Record makes the assertion that under the court decision the first and fourth class railroad property in the state is exempt from the operation of the Edge road tax act, although the legislature last winter clearly intended that this property should be taxed under that new law. The Supreme Court decision, Mr. Record contends, also makes the bank stocks taxable under the Edge road tax act, while the fact is that no member of the legislature intended to have this property taxed under the road act. Mr. Record, who fought the act as special counsel for Passaic, said that the Supreme Court "puts upon the statute books an act which differs materially from the act which was passed by the legislature and one which, in my judgment, under no circumstances could ever have been passed by our legislature."

"The decision holds that the first and fourth classes of railroad property are exempt from the operation of the road tax act. This property consists of the main lines of all of the railroads and of their franchises, and is valued by the State Board of Taxes and Assessments at approximately $300,000,000. This property was intended by the legislature to be included within the act, as was shown by the passage a few hours after the road tax act of another act appropriating the money to be collected from this property to the road tax fund.

"By this decision, therefore, the $300,000,000 of property intended by the legislature to be taxed, is removed from the operation of the law. This means that if the estimate of the cost of the state roads made by the state engineers at the time this act was passed proves to be correct, there will be a deficit of over $1,000,000, which must be made up by some form of taxation or by adding a further instalment to the road tax.

"The court holds that bank stocks are included within the road tax act. No member of the legislature intended to tax this property, and no county board of taxation or local board of taxation has attempted in assessing the tax under the act to reach this property.

"The same reasoning applies to the franchises of the telephone, gas, electric light and trolley companies. The legislature did not intend to include any of these properties, and no county board of taxation or municipal taxing board has attempted to levy any assessment on these properties under this act.

"If the decision of the court is to stand it would seem to be the duty of the municipal authorities of every municipality in the state to at once apply to the county board of taxation to have an assessment made for the current year on bank stock property and the franchise property of public utility corporations in each municipality.

"Whether this decision will be appealed is a matter to be determined by the authorities of the municipalities who caused the suit to be brought.

"It is plain, however, that if any attempt is made to carry out the decision of the court by imposing a tax upon bank stock property and franchise property of public utility corporations, the result will probably be that the act will some way or other be taken to the Court of Errors for further review."

Big Bond Issue Carried by Small Majority.

Tampa, Fla.—By a small majority of 16 votes, Hillsboro County has approved a bond issue of $875,000 for the construction of roads. Only a few over 1,800 voters cast their ballots, out of a qualified list of more than 4,000, and a total registration of more than 14,000. Bond issue advocates worked strenuously to the very end of the campaign while the opposition lacked strong organization. The county commissioners will now go ahead with the new road program as has been mapped out and will shortly advertise the bond issue to sell at a price not lower than 98. The county commissioners passed a resolution at a recent meeting agreeing not to sacrifice the bond issue for any less than that figure. Soon after the bonds are issued the tentative contracts which have been made with contractors will be ratified and the work on the new roads will be started as soon as material can be gotten on the ground.

Washington to Continue State Road Program.

Olympia, Wash.—In answer to a letter from L. W. Page, director of the office of public roads at Washington, D. C., state highway commissioner James Allen has announced that the state road program will not be changed because of the war unless an emergency should arise. "While expressing a constant willingness to consider and co-operate in any line of national policy or working plan which may be or become necessary to meet national needs, I think the character of our contemplated work demonstrates that there does not now exist any occasion for selections, eliminations or delay of any federal aid or state project now in mind. If any emergency shall arise we shall of course be watchful and ready to meet it as public policy demands, always giving the nation's greatest needs the preference," says Commissioner Allen. Commissioner Allen asserts that in this state the situation has not been very seriously affected during the past season, an average increase of perhaps 5 per cent. in road building costs, with some difficulties of shortage and transportation facilities, being met by the department. "So far as the state highway department is concerned, our road program—and this applies also to federal aid projects—includes work only on the state roads which are the main traffic routes whose continued construction and improvement is most necessary for war-time needs and possibilities as well as normal peace developments. Fully three-fourths of our work during 1917 is on roads that do not involve pavements or large structures, and therefore require only a minimum of railway transportation for their material. Our 1918 program for road work in Washington includes:

(1) "Eight forest road projects under section 8 of the federal aid road act. These cover sections of state highways in almost every instance on main traffic routes, from two to 14 miles on each project, to an aggregate of about 66 miles. Their total estimated cost is about $500,000, half from the federal forest fund. These projects are entirely under your office of public roads for their execution and supervision. Every one of these projects is of the character of work described in the preceding paragraph, requiring mainly labor, local materials on project, equipment which is fairly ample in hands of contractors or publicly-owned, auto trucks and supplies which seem likely to be amply available—with only a minimum of railway transportation necessary for incidental structures and supplies.

(2) "Eleven post road projects under the federal aid act. These cover as many sections of state highway, all on main traffic routes, from three to eighteen miles on each project, aggregating about 65 miles and reaching a total cost of about $500,000. Ten of these projects are of the character of work described in the preceding paragraph, requiring only a minimum of railway transportation of material or supplies.

(3) "Twelve state projects without federal aid, all on state highways and main traffic routes, from one to ten miles on each section, aggregating about 60 miles, at a total cost of approximately $400,000. All but two of these projects are of the class of work previously described which will be least impeded by abnormal conditions, unless labor shortage imperatively commands a halt for war needs. Two projects include bridge construction to the extent of about $100,000, which will require a large element of railway transportation, both bridge sites being in close proximity to railways.

"The preceding review covers the work with which the state highway department and the office of public roads will be directly concerned during 1918, aggregating a possible total of $1,400,000. Our various counties will probably strive to continue their programs on main county roads, which will probably at least double the total. A large part of the county work will take the form of pavements, mostly concrete, paid from county bond issues, local assessments and their permanent highway fund from state tax levy. Lack of railway transportation for materials may seriously affect these county paving projects, and of course the labor shortage possibilities will affect costs and progress."

Car Company Must Pay for Street Oiling.

Henderson, Ky.—The state statute which permits third class cities to oil streets, charging one-third of the cost to abutting property owners on each side of the street, and dividing the balance of the cost between the municipality and any traction company, occupying the street, has been held constitutional by the court of appeals. The Henderson Traction company refused to pay its assessment, alleging that the sub-section was an amendment to the statute, which was not mentioned in the title and made the statute cover more than one subject matter, and that it violated the federal constitution by depriving the company of property without due process of law. The court held that the sub-section is not an amendment, revision or extension to the statute, of which it purports to be a part, but a distinct act, fully set out in its title. It said that oiling a street is an improvement for the benefit of the property along it, and an assessment properly can be made against the traction company occupying the street.

West Virginia Educates Road Laborers and Engineers.

Charleston, W. Va.—The college of engineering of the West Virginia university, in co-operation with the state road commission, will give a short course in highway engineering, beginning Monday, January 14, to cover a period of three days, at Mechanical hall, in Morgantown. The course will consist of lectures and conferences by prominent road engineers within and without the state. The question of standard specifications will be discussed and considered by the county and division engineers of the state and representatives of the federal government, preparatory to adopting standard plans and specifications for all highway work within the state. The schools and conferences promise to develop some constructive plans that will be beneficial to all parts of the state. These conferences will be followed up by a series of extension schools held at Williamson, Parkersburg, Ronceverte, Charleston, Martinsburg, Elkins, Sutton, Romney and Wheeling, and lasting throughout the month. At these extension schools, in addition to the road problem, the traffic problem and traffic regulations will be considered. War-time road problems will be emphasized.

Meanwhile the state is extending and organizing its work of training reform school boys for practical road-building. The boys at Pruntytown are being taught the operation of road machinery and actual methods of road labor. About half of the grading of a brick road on a concrete base frm Fetterman to Pruntytown has been done by boys. The objects planned for the course are:

1. To interest the boys in road building so that they will desire to follow the work when they are released from school.
2. To train them in the practical line of knowing and doing good work, such as mixing and placing of concrete, the laying and grouting of brick, running and operating machinery, all of which requires considerable skill.
3. If they make good and become expert in the work, the state road commission will be in a position to recommend them and find employment after they are released.
4. While the boys are being trained, their labor will be a great help in the construction of the road planned, thereby being of immediate benefit to the community and state.

SEWERAGE AND SANITATION

Savannah Completing Big Sewerage System.

Savannah, Ga.—The city's new sewerage system, in process of construction for three years, is now practically completed at a cost of over $1,000,000. Following a sanitary survey by the Rockefeller foundation in 1912, public opinion gradually came to demand the abolition of the inadequate drainage system and the dry closets. In 1914 and 1916 bond issues for more than $1,000,000 were passed for the purpose of constructing a comprehensive sewerage system. The open creeks which carried the sewage were converted into reinforced concrete tunnels. On account of the general elevation of the city, the whole system is operated by gravity, one of the creek grades being changed to give greater fall. In January, 1913, the city had 53 miles of sanitary sewers and 39 miles of storm sewers which had been built at a cost of $930,000. In practically the last two years $1,021,248 from bond issues and $25,000 from current appropriation, a total of $1,046,248, was spent on the new system, which is expected to provide for the city's growing population for many years in the future.

Wants Health Department to Sell Milk.

New York, N. Y.—The board of aldermen recently considered a resolution "designating the commissioner of health as agency for the purchase, storage and sale of wholesome milk for the use of infants." Former commissioner of health Haven Emerson has sent the board a letter summarizing an investigation of the possibilities of carrying out this plan. He says:

"There are upwards of 10,000 retail grocery stores in New York City where Grade B pasteurized milk is now being sold from cans. At these stores 80 per cent. or 710,654 quarts a day of all the milk brought into the city in cans are sold to the consumer. Of milk sold in bottles, 598,671 quarts a day are delivered direct to the consumer at home, and 105,647 quarts a day are sold through grocery or dairy stores. Of the loose or can milk sold at grocery stores, 90 per cent. is sold at 10-11 cents a quart.

I have obtained from six leading dealers in milk in this city, including the company representing the organized producers of milk, statements as to the price at which they would sell to me as agent of the City Grade B pasteurized milk in bulk (40-quart cans), delivered at 150 points in the congested parts of the five boroughs where the wage earners and people of small means chiefly live.

One company, with a large retail business, has no milk to spare, its entire supply being used for its present trade. Companies offered milk up to January 1 with prices varying from 9½ to 10½ cents per quart. The city would have to pay for tubs, ice, dippers, space to conduct the business, service during certain hours, and supervision to maintain sufficient control over the business of purchase, sale, etc."

The commissioner concludes on this question: "In view of the ample opportunities in all parts of the city for people of small means to buy wholesome milk at 10-11 cents a quart, and since the city could not possibly sell milk at cost at a price less than 10 cents a quart, I recommend that the city do not enter into the retail milk business at the present time. There is, however, a great service to be done by the city in this time of deprivation among the poor families, who have little children to rear, well worth the small investment it would cost. There is genuine need for a wider distribution of milk at a cost less than the present retail price even of loose milk at stores bought on the cash-and-carry basis. Less milk has been used as the price has advanced. Under-nourishment is increasing in school children. Milk should be the exclusive food for artificially-fed babies under one year of age, and is an essential food for all children from one to two years of age. It is the cheapest and most valuable food for children even at its present price. I would propose the following plan for spending whatever sum of money the city is prepared to appropriate for adequate provision of milk for little children:

> "Tickets, each good for two cents when applied towards the purchase of milk, should be issued by the city through the department of health or the department of charities, direct to parents of little children, or through organized and responsible relief agencies, where the need of the family has been verified by suitable visit of a nurse or other agent to the home. Such tickets should be redeemable at any retail store where suitable quality of milk is sold, or at the baby health stations of the department of health, and only when there is reasonable assurance that the milk will be used for children under 6 years of age, for whom the need is obviously most urgent.
>
> "I understand that a representative of the Dairymen's League, as well as a spokesman for the large milk distributors, offerred each to duplicate any sum the city appropriated for providing milk for the needy. If this offer still holds, and the city could, by spending $25,000, obtain the value of $50,000 more in the form of milk or rebate on the cost of milk at the rate of 2 cents a quart, a truly remarkable improvement in the health of many children would be seen ,and seen promptly. On this plan 3,750,000 quarts of milk at 10 cents could be sold to the needy at 8 cents a quart, a price which is not beyond the means of any people who are not public charges, or, in other words, 20,000 children under 2 years of age could be supplied with practically all their nutritional needs for six months."

Cover State in Mosquito Elimination Work.

Sacramento, Cal.—In order to investigate the presence of disease-bearing mosquitoes in California Professor W. B. Herms, associate professor of parasitology in the university of California and consulting parasitologist of the state board of health, in company with a group of assistants, has traveled nearly 14 000 miles by automobile during the past two summers. In addition to this mileage by automobile, more than 2,000 more miles were made by train. During this time all but three counties were visited, these being Inyo, Mono and Alpine, which will be included in next summer's work. The survey took the party from an elevation below sea level in the Imperial valley to about 8 000 feet above sea level in the high Sierras, from a temperature of 120 degrees in the shade to freezing on the Fourth of July. The work was carried over the state boundary line into Oregon, Nevada and Mexico. During the course of the survey about four thousand mosquitoes were collected at 375 points, consisting of about twenty-five different species, much work being involved in the preparation and identification of these insects. The object of this work, according to professor Herms, is to locate the disease-breeding species and determine their breeding places, and then to advise communities in the best methods of control so that malaria may be eliminated in the state.

STREET LIGHTING AND POWER

State Commission Upheld on Gas Main Extensions.

New York, N. Y.—The public service commission believes that its power to compel public service corporations to make needed additions to existing facilities has been established by the decision of the United States supreme court in the Douglaston, L. I., gas main case. This has been regarded as one of the most important cases in the commission's history, and it was said that the decision would greatly strengthen the commission's power to deal with questions of better service on the part of companies who furnish transportation, electricity and gas to the public. A long time ago the commission ordered an extension of the mains of the New York and Queens Gas Company from their present terminal in Flushing so as to serve adjacent portions of the same ward in the communities known as Douglaston, Douglaston Manor and Little Neck, in the borough of Queens, at an estimated cost of about $60,000, a large part of which cost was attributable to improving and enlarging the old mains so as to allow future growth of Flushing and its outskirts. It was undisputed that the net return upon the cost of the extension would for some years be less than 3 per cent, yet the commission upon the record as a whole held that the proposed extension was a reasonable one and should be ordered. The appellate division for the first department reversed and set aside the commission's determination, and held that the "reasonable extensions" of gas mains which, under the public service commission law, the commission might order should be interpreted as meaning those which were reasonable in the eyes of the courts. The Court of Appeals unanimously reversed the determination of the appellate division and reinstated the commission's order, holding that the commission, as an expert administrative board, was entitled to determine the questions of fact and questions of policy involved in the decision as to what extensions were reasonable, and that the courts could not substitute their judgment for the fact findings of the commission. The company thereupon obtained a writ of error and carried the case to the Supreme court of the United States.

Commission Approves "Readiness-to-Serve" Charge.

Trenton, N. J.—Decision has been rendered by the state public utility commission in the matter of the application of the New Jersey Northern Gas Company for approval of increased rates. The commission has established a schedule of rates which constitute that each connected customer shall pay a "readiness to serve" charge of 25 cents a month without gas, and for all gas consumed a net charge of $1.55 shall be made for each 1,000 cubic feet. The increase is to be accepted by the company under the express condition that the schedule of rates allowed shall be subject to revision when conditions as to cost of labor and material shall return to substantially those existing last year. The company has been receiving a revenue of $1.60 gross, less 10 per cent. per 1,000 cubic feet of gas, with a discount for prompt payment. An increase was first applied for in June last but in August the commission denied the application because of the failure of the company to show detailed facts regarding costs of operation, etc.

FIRE AND POLICE

Blaze Sweeps War Industrial Section.

Hoboken, N. J.—Probably only the timely aid of soldiers and sailors saved that part of Hoboken given over to war industries from destruction by a fire which reduced to ruins a paper stock storehouse and nearby buildings and threatened to sweep the waterfront. Hoboken was in a position of danger owing to low water supply, while the wind hourly threatened to become stiff enough to waft sparks from burning waste to military storehouses, transport piers and munition plants. The uptown portion of Hoboken was practically without water because of exhaustion of the supply by the torrents poured upon the fire. It was almost entirely without light, as well, because of the destruction of cable mains leading from the Public Service Corporation plant near the burned buildings. The whole district about the burning ruins—all of it within the zone barred to enemy aliens—was patrolled by military police. The immediate fire, as a result of a day-long battle, was under control, but continued burning for a day. The fire was one of the most dangerous of recent years. It started about 8 o'clock in the morning in the paper stock warehouse. The local department at once found itself hampered by low-water pressure. The place was a furnace by the time the first engines arrived. Fire department officials realized immediately the danger not only to a big warehouse of New York grocers, near by, but to the Remington Arms plant three blocks away, the government piers and storehouses four blocks, a bakery across the narrow street from the burning building, the Tietzen and Lang dry docks, and the Fletcher iron works. They sent an emergency call to the government military authorities and to the fire departments of Jersey City, West Hoboken and New York. Captain Craig went to the fire in command of two companies of infantry, while 500 sailors were dispatched from the Brooklyn Navy Yard on tugs. Chief Kenlon sent fireboats from New York's department, and the Jersey cities which were appealed to sent fire companies. Soldiers and sailors were sent primarily to police the neighborhood and to aid in removing government stores in case of extreme danger, but before long they were sharing in the fire fighting. The sailors brought a quantity of hose with them. Firemen, covered with ice and half-frozen, were forced from time to time to drop their lines for a brief respite, and time and again soldiers and sailors sprang to their relief. Flying bits of paper ignited a few freight cars, kindled small blazes on nearby roofs and fired a truck load of waste paper stalled in the street because of the fire lines. Policemen, firemen, soldiers and sailors were stationed on roofs in every direction, watching for incipient fires and quenching sparks. In addition a water canopy was established by playing innumerable lines of hose against the east wall, so that when it finally did topple outward, the water curtain forced the burning paper to descend. The collapse of another wall shortly afterward half buried firemen Callahan and Lang, who were taken to the hospital, the only men badly hurt. Shortly after the big grocery warehouse became ignited a wall there fell in, carrying burning roof and floors into a pit of flame. The menace of the spread of the fire from that direction greatly was reduced when the firemen thus gained access to the interior, and within a few hours it was well within control.

Street Car Equipment Burned Out.

Saginaw, Mich.—Saginaw's street railway rolling stock was almost completely wiped out in an early morning fire of unknown origin which destroyed a large section of the barns. From 35 to 40 cars were burned, four being gotten out and three more had not yet been brought in. The loss was estimated at $200,000. Inadequate water pressure and the necessity of cutting down trolley wires handicapped the work of the firemen. The section of the barn containing the Michigan Railway company's interurban cars was barely saved and for some time there was danger of the roof collapsing on them. Several cars were brought from Bay City in the morning, and others were obtained from other cities to relieve the situation as the service was crippled almost to uselessness.

$2,000,000 Fires in Norfolk.

Norfolk, Va.—Three separate fires which destroyed five of the city's largest buildings and did damage totalling $2,000,000, scared the city at the threatened danger to the naval and military posts from incendiary plots. A number of suspects were arrested. Nearly two blocks were swept. Three men were killed and a score injured in a series of explosions. Mayor Mayo practically turned the city over to the naval authorities, who kept it under martial law. The fire started before dawn in the old Granby Theatre and gained headway rapidly, as the firemen were handicapped by frozen fire hydrants, low water pressure, and near-zero temperature. The blaze spread to the Monticello Hotel and other buildings in the block. It was got under control late in the day, but started anew early at night, leaped across the street and leveled half of the block there before being checked. Falling floors and walls took toll of firemen and naval guards. One fireman, Charles McCoy, was killed and seven others were hurt in the collapse of an upper floor of the Monticello Hotel in the day, and at night two firemen and several sailors were caught by a falling wall of another building. Three were taken out badly hurt, but two others were left in the debris. Firemen of Norfolk, Portsmouth and Suffolk, with organized sailor fire brigades, fought heroically amid ice and blinding smoke, and bluejackets led the rescue work when the fighters were trapped. Several of the firemen caught in the hotel were taken out alive through the daring of a score of sailors. Many apartment house dwellers were rendered homeless and were taken care of in the armory by Red Cross workers. When the firemen arrived at the theatre blaze and found themselves helpless from lack of water they called for help from Portsmouth. When water finally ran the pressure was so low that the upper stories could not be reached. The blaze was checked when falling sparks ignited the hotel. The men were making good headway against this blaze when an explosion occurred in a cloak shop and another blaze started. Suffolk was then called for help and then the navy yard and naval brigade arrived.

Many Dwellings Burned in Warehouse Blaze.

Pittsburgh, Pa.—A rain of embers poured down on an area covering 15 blocks on the Southside in a night fire which burned twelve buildings, including a four-story warehouse, with a loss of over $100 000. When the firemen arrived the warehouse was in flames and five minutes later was spreading fast. It was filled with furniture, varnish and excelsior. The houses across the narrow street were endangered and the police had great difficulty in clearing them of their inhabitants, as the fire was located in the Polish section of the city. The roofs of many houses caught fire, but the flames were put out. Alarms called engines from all over the Southside, South Hills and downtown sections of the city. When a wall fell and the crowd thought that some firemen had been buried under it the police lines were broken by the excited spectators.

Big Fire at Beach.

Long Beach, L. I., N. Y.—An early morning fire destroyed four buildings here, doing a damage of about $250 000. The buildings included a moving picture theater, a concrete apartment house, owned by John C. Hammond, a former village trustee, and two stores. About 200 feet of the boardwalk were also destroyed. The buildings adjoined one another. The fire started under or near the boardwalk, probably under the theater. The lower part of this building was being remodeled into bathing houses, and it is possible that the fire resulted from carelessness on the part of a workman. The police are working on the theory that an enemy of former trustee Hammond started the blaze. The Long Beach firemen, with their gasoline engine, worked hard to check the blaze and were aided by two fire companies from Rockville Centre. The firemen were greatly handicapped by the low water pressure. There was a pressure of only about twenty-two pounds most of the time, and at one stage of the fire there was not enough water to feed both engines. In addition to this the fire-fighting force of Long Beach was inadequate. Although the village has an up-to-date engine, it has but few men to use it. The police force numbers only four men, including the chief, and these four had to do most of the fire-fighting before the Rockville Centre company arrived.

Ice-Crusted, New York Firemen Continue Fights.

New York, N. Y. The epidemic of fires described last week continued during the whole week, bringing many of the men to the point of exhaustion. Blaze after blaze, many of them dangerous, kept the apparatus and men on a continued run. Chief Kenlon was kept away from his bed for seventy-two hours and found no time to eat for twenty-four. Two stubborn simultaneous fires kept about five hundred firemen under seven battalion chiefs and chief Kenlon out in the freezing weather until they were practically mounted in ice and hardly able to move. At one fire, a big paper box factory, constructed with wood interior was ablaze with a seldom equalled intensity and had driven thousands of Italians in crowded neighboring tenements out into the street. The building was sheeted in ice. Some of the men were frozen to the sidewalk and had to be cut away with axes. Just as the firemen were beginning to gain headway against the fire, two great mains burst from the high pressure, diverting enough water to reduce greatly the effectiveness of the streams played on the fire. Consequently the fight was prolonged for several hours and the plight of the firemen, between the battle against the fire and the battle against the ice, constantly grew worse. At one of the biggest fires the next day, one fireman, John

J. Frein, engine company 65, lost his life when the beams of a roof fell on his head and crushed him. Three other firemen working on the same floor were knocked unconscious by the wreckage and would have perished had they not been dragged out by their comrades. This difficult fire lasted more than three hours and caused a loss of about $75,000.

Eight-Hour Day for Policemen.

Dallas, Tex.—Motorcycle men and patrolmen have been placed on an eight-hour day basis, according to an announcement by chief of police John W. Ryan. Formerly the men were worked twelve hours per day. So far as known all other large cities in Texas have already adopted the eight-hour system for patrolmen and motorcycle men. It is probable that a plan will be evolved later whereby the desk men, captains and sergeants will work only eight hours.

Fire Sweeps Munitions Plant.

Harrisburg, Pa.—Three acres were swept by a fire which burned down several departments of the Harrisburg Pipe and Pipe Bending Company which was at work on shell cases for government use. The loss exceeded $250,000 and the blaze was thought to have been started by a cigarette thrown into a paint can in the paint shop. The members of eight fire companies worked until late in a temperature near zero to prevent the flames from spreading. They were considerably hampered by the lack of fire plugs in the vicinity of the plant. Two firemen were injured in the fire and taken to the hospital. A strong east wind aided the firemen in keeping the flames from the other buildings. At several times it looked as though the fire would reach the remaining buildings, but the heroic work of the firemen and employes of the company kept the fire from assuming even larger proportions. Fire chief Kindler and city officials blamed difficulties on the small water mains at the plant, the inadequate hydrants and the bad condition in which the few hydrants there were at the time of the blaze.

Police and Firemen Get Salary Increase.

Portsmouth, O.—An ordinance granting the policemen and firemen and certain employes of the city an increase of 20 per cent in salary has been passed by the city council. Under the ordinance the police chief and his assistants will receive the following salary after January 1: Police chief, $1,500; day captain, $1,200; night captain, $1,200; one night sergeant, $1,140; one day turnkey, $720; four day patrolmen and fourteen night patrolmen, those having two years or more continuous service to receive a salary of $1,080 per annum; those having over one year and under two years of service to receive a salary of $1,020; those having under one year of service to receive a salary of $960. The fire chief and his assistants will receive the following: Fire chief, $1,500 a year; assistant chief, $1,140; three captains, $1,200 each per year; one electrician, $1,080; two watchmen, $720; thirteen firemen, those having two years or more of continuous service will receive a salary of $1,080, and those having less than one year's service to receive $960. The ordinance also provides for service from a volunteer force in case of an emergency and fixes the price at 50 cents per hour.

New Garbage Plant on Fire.

New York, N. Y.—A fire, believed to have been caused by a careless employe smoking near gasoline tanks in the storage warehouse of the new city garbage reduction plant of the Metropolitan By-Products Company on the Fresh Kill, Green Ridge, Staten Island, caused a loss of about $50,000 and damaged conveyors and piers so that the plant could not be operated for about ten days. Deputy fire chief W. T. Beggin said he had no cause to believe that any one had sought to destroy the garbage disposal plant so that the civic associations of Richmond might renew their fight to have the works removed from the island. Officials of the company had found no cause for the fire, and they were not inclined to believe that it was incendiary.

GOVERNMENT AND FINANCE

Commission Form Adopted.

Raymond, Wash.—At the close of a very exciting campaign Raymond voted to adopt a commission form of government by a majority of 185 out of a total of 969 votes cast. The Greater Raymond Club carried on the fight for the change, and mayor A. C. Little led the forces which opposed the change. The proposition carrying in seven out of the nine precincts.

Lubbock, Tex.—The city has voted, by a large majority, in favor of adopting the commission form of government. The balloting stood 289 to 47.

Increased Pay for New York City Laborers.

New York, N. Y.—Between 5,000 and 6,000 city employes, it is estimated, who receives less than $3 a day, are to get an increase in pay as a result of action taken recently by the board of aldermen in adopting a resolution asking the Bureau of Personal Service of the board of estimate to prepare wage schedules for all departments of the city and county government based upon a minimum rate of $3 a day for all laborers provided for in the 1918 budget at less than $3 a day. The board of estimate, in preparing the 1918 budget, fixed the minimum pay for laborers employed by the city at $2.75 a day. Some had their pay fixed at a minimum of $2.85 and others at $2.90. The men had asked for a minimum of $3 a day. While not granting the $3 minimum itself, the board of estimate set aside $1,500,000 as a contingency fund for labor, and recommended that the board of aldermen, if it saw fit, fix another minimum scale. The resolution attributed the need of higher wages to "economic and industrial conditions." The Bureau of Personal Service reported as follows:

> "The sum of $1,500,000 recommended by the board of estimate and apportionment is against the general tax levy of the city and increases in compensation for county employes cannot properly be charged to this fund, but must be county charges. The amount involved in the application for the proposed rates in the county offices is relatively insignificant and will probably not amount to more than $5,000 at the outside. This amount, if required, could be provided by special revenue bonds chargeable to the separate counties.
>
> In calculating the amounts required for annual employes in the labor class in the various departments, an allowance of $72 per annum has been made as most nearly approximating the proposed increase in the minimum rate for per diem labor of 25 cents a day from $2.75 to $3. That means that for full time labor on an annual basis, which is regarded as equal in value with per diem labor, a minimum rate of $912 has been employed as a basis of calculation. For part time labor, such as women cleaners employed in public buildings, increases have been allowed proportionate to the hours of labor. In the group of employes known as laborer-watchman, a rate of $720 per annum has been provided in the budget as against a flat rate of $600 at the present time. These positions are filled by laborers who, by reason of advancing age or other physical disability, are unable to perform the full duties of regular laborers. An increase in compensation from $720 to $792 is provided for them in this report. Similarly, an increase of 25 cents a day has been provided in this report for special classes of per diem employes whose services are not as onerous as those of regular laborers.
>
> "The following is a list of the departments and institutions which have not been included in this calculation: Education (Manhattan Truant School, Brooklyn Truant School and New York Parental School, nearly all the employes receive maintenance); libraries, New York Botanical Garden, New York Zoological Garden, New York Aquarium, Metropolitan Museum of Art, American Museum of Natural History, Brooklyn Institue of Arts and Sciences, Brooklyn Botanic Garden and Arboretum (not scheduled); health (Otisville Sanatorium and institutional helpers such as orderlies, helpers, domestics, etc., most of whom receive maintenance); public charities (institutional helpers such as hospital helpers, attendants, laundry helpers, etc., most of whom receive maintenance); Bellevue and allied hospitals (institutional helpers such as hospital helpers, attendants, laundry helpers, etc., most of whom receive maintenance); correction (institutional helpers such as prison helpers, etc., most of whom receive maintenance); public service (paid from revenue bond issue)."

The total required to put in operation the minimum rate of $3 per day for regular labor and corresponding rates for annual employment is $430,060.84, of which amount $36,255.80 is chargeable to funds other than tax levy and not a charge against the proposed item of $1,500 000. The total amount required from the fund of $1,500,000 is $393,805.04. This does not include any possible increases in prevailing rates for the various skilled trades which come within the provisions of the state labor law.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Concrete.

Two-Course Concrete Road Construction by Wayne County, Mich. Specifications used during 1917. 1 ill., 800 words. Engineering and Contracting. Dec. 5. 10 cts.

Cold Weather Construction of Concrete Roads. Some useful suggestions. 1,000 words. Engineering and Contracting. Dec. 5. 10 cts.

Concrete Paving in Sioux City. A letter from T. H. Johnson, city engineer. 1,200 words. Concrete. December. 20 cts.

Experimental Sections of Concrete Roads near Gravesend, Kent. By H. T. Chapman, county surveyor. 1,000 words. The Surveyor. Nov. 2. 40 cts.

Cracks in Concrete Pavements. Conclusions from 7-year investigation by U. S. Office of Public Roads. Setting contraction; wetting and drying; waterproofing. 1,000 words. Municipal Journal. Dec. 15. 10 cts.

Cost of Concrete Paving in Savannah. Itemized cost for 31,503 sq. yds. 800 words. Municipal Journal. Dec. 22. 10 cts.

Interurban Line Hauls Material for Concrete Road. Cars spotted along work for unloading. Different aggregates used in two-course paving. Grader scrapes concrete. 3 ills., 1,200 words. Engineering News-Record. Dec. 20. 15 cts.

Mechanical Loading at Concreting Plant Eliminates Laborers. Estimates that crew of 25 men can do work ordinarily requiring 42 men. Bins mounted on truck. 2 ills., 1,000 words. Engineering News-Record. Dec. 13. 15 cts.

Construction.

Road Construction on Clay Subsoils. Report on a failure. By F. C. Uren, Aldershot, surveyor. 1,000 words. The Surveyor. Nov. 30. 40 cts.

Building 21 Miles of New Military Highways at Camp Funston, Kansas 3 ills., 1,200 words. Better Roads and Streets. December. 15 cts.

The Toronto and Hamilton Highway. Construction. From a paper by G. H. Gooderham. 3 ills. 3,500 words. Good Roads. Dec. 15. 10 cts.

Temporary Oil Heating Plant Saves Hauling Oil 40 Miles. 1 ill., 600 words. Engineering News-Record. Dec. 6. 15 cts.

Road Work on Punitive Expedition to Mexico. From a paper by Capt. Ernest Graves. 1 ill., 3,500 words. Engineering and Contracting. Dec. 5. 10 cts.

The Storm King Road. A detailed description of the difficulties encountered in designing and constructing the Storm King Road. By H. E. Breed. 9 ills., 2,000 words. Good Roads. Dec. 8. 10 cts.

Motor Truck Dumps 5 Batches in Succession Into Mixer Skip. 400 words. Engineering News-Record. Dec. 27. 15 cts.

Convict Labor.

Convict Labor for Road Work. Efficiency and economy, management, costs, camp location and camp sanitation, camps, quarters, rations, etc. Bulletin No. 44, U. S. Dept. of Agriculture, U. S. Office of Public Roads. 218 pages. Government Printing Office.

W. Va. Prison Camp No. 3. Results with convict labor on road work. 4 ills., 1,000 words. Better Roads and Streets. December. 15 cts.

The South's Labor Problem and Its Effect on Road Work. Big wages demoralize negro workers, Convicts have been used effectively. Outlook brightened by greater use of machinery. By W. S. Keller. 1,000 words. Engineering News-Record. Dec. 6. 15 cts.

Design.

Tests of the Influence of Grading on the Value of Fine Aggregates for Concrete Road Work. Results of a series of tests by F. H. Jackson of the Office of Public Roads. 10 ills., 4,000 words. Good Roads. Dec. 29. 10 cts.

Crushing Strength and Paving Stone. 600 words. Stone. December. 15 cts.

Intense Study of Highways Forced by Circumstances. Changes induced by heavier and speedier traffic outlined. Several new types described. 2,000 words. Engineering News-Record. Dec. 20. 15 cts.

Failure.

Concentrated Pressure Causes Many Pavement Failures. Brick surfaces suffer particularly because grout is frequently unevenly distributed over area of vertical face. By A. H. Hinkle. 1 ill., 1,500 words. Engineering News-Record. Dec. 6. 15 cts.

Federal Aid.

Good Progress Made in Operation of Federal Aid Road Act. Meaning of "Post Road" defined. 2,500 words. Engineering News-Record. Dec. 20. 15 cts.

One Year's Experience with the Federal Aid Road Law. From the paper by Logan Waller Page. 4,000 words. Good Roads. Dec. 22. 10 cts.

Finance.

Uniform Road Financing. From an address by D. M. Clark. 2 ills., 5,000 words. Southern Good Roads. December. 10 cts.

General.

Present Conditions Affecting Road Construction and Measures Taken to Meet Them in the Central West. From a paper by S. E. Bradt. 1,500 words. Good Roads. Dec. 22. 10 cts.

The Need of Centralization in Highway Control. From an address by Logan Waller Page. 1,000 words. Engineering and Contracting. Dec. 5. 10 cts.

Paved Crossings for Carrying Water Over Road. Used where there is no drainage channel. 1 ill., 300 words. Engineering and Contracting. Dec. 5. 10 cts.

Car Shortage and Its Relation to Highway Work. From an address by C. M. Upham. 1,800 words. Engineering News-Record. Dec. 13. 15 cts.

Military and Other Highways in War Time. From an address by W. D. Sohier, Massachusetts Highway Commissioner. 7,000 words. Engineering News-Record. Dec. 13. 15 cts.

Hauling.

Road Material Haulage in Wayne Co., Mich., by Industrial Railway. This method of transportation is used exclusively on long hauls. Outfit. 600 words. Engineering and Contracting. Dec. 5. 10 cts.

Joints.

Concealed Joints in Concrete Pavements. Advantages of use. General discussion on joints. 1,250 words. Municipal Journal. Dec. 15. 10 cts.

Maintenance.

Road Maintenance in Kent. By H. T. Chapman, county surveyor. 2,000 words. The Surveyor. Nov. 30. 40 cts.

Maintenance and Repair of Public Roads. By W. S. Keller. 2 ills., 1,500 words. Better Streets and Roads. December. 15 cts.

Maintenance of Roads. By D. Tucker Brown. 1,500 words. Better Roads and Streets. December. 15 cts.

The Maintenance of Gravel Roads. From a paper by P. D. Sargent. 2,000 words. Good Roads. Dec. 29. 10 cts.

Two Methods of Maintaining Gravel Roads in Maine. Density of traffic is criterion. Chief reliance is placed on annual tar treatment. Frost is worst enemy. 1 ill., 1,600 words. Engineering News-Record. Dec. 27. 15 cts.

The Maintenance of Earth Roads. From a paper by Jno. H. Mullin. 1,500 words. Good Roads. Dec. 29. 10 cts.

Proposed Method for Maintaining a County Road System. System recommended for Dallas County, Tex. 1,000 words. Engineering and Contracting. Dec. 5. 10 cts.

Mechanical Plant Largely Used in Pennsylvania Road Maintenance. Labor difficult to hold during past season. Great increase in use of roads by motor trucks. Embargo halts work. By Geo. H. Biles, Second Deputy Commissioner. 1,800 words. Engineering News-Record. Dec. 13. 15 cts.

Oiling.

Los Angeles County Tests for Road Oils. Specifications for road oils for macadam and for earth. By W. Arthur Brown, chemist. 2,000 words. Better Roads and Streets. December. 15 cts.

Cost of Oiling Hamilton Streets. By E. R. Gray, city engineer. 1,500 words. Canadian Engineer. Dec. 13. 15 cts.

Railway Tracks.

Rail for Paved Streets. Tram girder rail has a number of advantages over the grooved section. By Martin Schreiber. 5 ills., 1,200 words. Electric Railway Journal. Dec. 1. 10 cts.

Methods and Materials for Paving Between Street Railway Tracks. The practice in Ottawa, Canada. By A. F. Macallum. 4 ills., 1,100 words. The American City. December. 50 cts.

Resurfacing:

Resurfacing Old Concrete Road with Three Inches of Concrete. 1 ill., 1,000 words. Engineering and Contracting. Dec. 5. 10 cts.

State:

Road Legislation in Pennsylvania During 1917. 2,500 words. Good Roads. Dec. 22. 10 cts.

War Work of the State Highway Departments. By G. P. Coleman. 1,500 words. Good Roads. Dec. 15. 10 cts.

The New Kansas State Highway Administration Law. Outline of system as presented by W. S. Gearhart, State Highway Engineer, in a recent paper. 3,000 words. Engineering and Contracting. Dec. 5. 10 cts.

Minnesota Plans $7,500,000 Roadwork for 1918. 1,500 words. Engineering News-Record. Dec. 20. 15 cts.

Highway Department Organized in Texas to Spend $9,000,000. Office system devised for handling of motor-vehicle license fees, which will be spent on roads. 4 ills., 1,500 words. Engineering News-Record. Dec. 6. 15 cts.

Surveys.

Instructions of Missouri State Highway Department for Making State Road Surveys and Plans. Reconnoissance; final survey; survey line; side location; alternative lines; levels; cross-sections; drainage, and culverts. 2,000 words. Engineering and Contracting. Dec. 5. 10 cts.

Wood Block.

Creosoted Block Can Be Laid on Hardened Pitch Cheaper Than on Dry Mortar. If base is proportioned to provide slight excess of mortar it can be finished to a sufficiently even surface with wood floats. Inspection of block after laying is easy. By Walter Buehler. 3 ills., 2,000 words. Engineering News-Record. Dec. 20. 15 cts.

SEWERAGE.

Activated Sludge.

Are Fine Screens Needed for the Activated-Sludge Process? Discussion by G. B. Gascoigne and T. C. Hatton. 1,250 words. Engineering News-Record. Dec. 6. 15 cts.

Construction.

New Record on Chicago Sewer Construction. Organization when making a record for a single day's run. By J. E. Love. 1 ill., 600 words. Engineering and Contracting. Dec. 12. 10 cts.

Shallow-Covered Tunnel Builds Soft Bottomed Sewer Where Open Cut With Steam Shovels Failed. Bottom of soft clay came up and sides were unable to bear weight of shovel. 5 ills., 1,200 words. The Contractor. Dec. 21. 10 cts.

Design.

Cleveland Sewage Screen Plans Withdrawn from State Department of Health. 1,700 words. Engineering News-Record. Dec. 13. 15 cts.

Joints.

Poured Grout Joints for Sewer Pipe. By H. T. Boynton. 1 ill., 600 words. American City. December. 50 cts.

Odors.

Burn Sewage Gas to Eliminate Odor. Experience in Rock Hill, S. C. 400 words. Engineering News-Record. Dec. 13. 15 cts.

Odors from Sewage Treatment Plants. Experiences at a number of plants in the U. S. and opinions of sewerage specialists. Time required for septicization. 3,000 words. Municipal Journal. Dec. 29. 10 cts.

Operation.

Foaming of Dallas Imhoff Tanks. By Chas. Saville & R. H. Gould. 600 words. Engineering News-Record. Dec. 6. 15 cts.

Sludge.

Pressing of Sewage Sludge. By Kenneth Allen. 2,000 words. Canadian Engineer. Dec. 6. 15 cts.

Testing Plants.

Syracuse Tests Two Methods of Sewage Treatment. Activated-sludge process being studied alongside Dortmund tanks combined with aerated continuous gravel filters. 800 words. Engineering News-Record. Dec. 27. 15 cts.

Treatment.

The Greenwich Sewage Treatment Plant. Imhoff Tanks located on Island in the Sound near the city. Effluent from tanks treated with chlorine. Difficulties of construction due to mud and quicksand. 11 ill., 1,600 words. Municipal Journal. Dec. 29. 10 cts.

Sewage Disposal for a New York Area. Caring for waste flow from a population of 2½ million on flat land draining into a shallow bay. Preventing pollution of oyster beds. Dilution. 3 ills., 2,000 words. Municipal Journal. Dec. 15. 3,000 words. Municipal Journal. Dec. 22. 10 cts each.

Sewage and Its Precipitation. Further Experiments. By Reginald Brown. 6,000 words. The Surveyor. Oct. 26. 40 cts.

WATER SUPPLY.

Accounts.

Deficiency in Water Accounts. Dealing with deficits. By A. Gordon Edwards. 1,500 words. The Surveyor. Nov. 2. 40 cts.

Construction.

Construction Features of Water Supply System and Sewerage Works of Camp Custer Cantonment. 5 ills., 3,500 words. Engineering and Contracting. Dec. 12. 10 cts.

Methods of Underground Survey for Wilson Ave. Water Supply Tunnel, Chicago. 1,000 words. Engineering and Contracting. Dec. 19. 10 cts.

Evaporation.

Evaporation from Water Surfaces and River-Bed Materials. By R. B. Sleight. 3 ills., 2,000 words. Canadian Engineer. Dec. 20. 15 cts.

General.

The Basis of Water Charges in Urban Areas from the Point of View of Common Utility. By E. C. Rodda. 2,000 words. The Surveyor. Nov. 30. 40 cts.

Water Department and the Public Health. From a paper by H. E. Barnard. 1,500 words. Canadian Engineer. Dec. 20. 15 cts.

Location of Water Mains, Connections and Valves Kept on Card File. 1 ill., 300 words. Engineering News-Record. Dec. 6. 15 cts.

Joints.

Cement Joints for Cast Iron Water Main. 1,000 words. Engineering and Contracting. Dec. 12. 10 cts.

Pipes and Mains.

Overland Pipe System, Ottawa Water Works. New pumping plant has normal rating of 40,000,000 gals. a day. Water carried over land through two lock-bar steel pipes to city distributing system. Bridge built to carry pipes from island to main land. By L. McLaren Hunter. 8 ills., 1,600 words. Canadian Engineer. Dec. 20. 15 cts.

Hydrostatic Tests of 36-Inch Submarine Pipe Line. 600 words. Engineering & Contracting. Dec. 12. 10 cts.

Design and Construction Methods for Copper Lining for City Tunnel of New York Catskill Aqueduct. 4,000 words. Engineering & Contracting. Dec. 12. 10 cts.

Cost of Water Main Construction at Pasadena, Cal. 800 words. Engineering & Contracting. Dec. 12. 10 cts.

Unit Figures for Estimating Cost of Laying Pipe. Unit cost figures are given for trenching and back-filling, laying pipe and making joints. By Geo. Wehrle. 5,000 words. Gas Age. Dec. 15. 15 cts.

What are the Limitations of Wood Pipe Under Fills? Failure under 10-foot back-fill emphasizes need for careful examination of soil before specifying pipe strength. 1,200 words. Engineering News-Record. Dec. 27. 15 cts.

Operation.

American Water Works Laboratories. Data on the laboratory procedure at various water works. 1 ill., 2,500 words. Engineering & Contracting. Dec. 12. 10 cts.

City Water and Light Plants Operated on Same Basis as Private Utility. Result in Holland, Mich. 1 ill., 1,000 words. Engineering & Contracting. Dec. 12. 10 cts.

Pollution.

Pollution of Drinking Water from Failure of Connections in Manufacturing Establishments. 700 words. Engineering & Contracting. Dec. 12. 10 cts.

Pumping.

Electrically Operated Pumping System of New Orleans. Unusual conditions make three separate systems necessary. Details of water, sewage and drainage systems. 5 ills., 2,000 words. Electrical Review. Dec. 22. 10 cts.

One-Hundred-and-Ten - Milion - Gallon Pump for St. Louis. A turbine-driven 13-stage centrifugal pump will act against a head of 65 feet. By H. F. Gauss. 4 ills., 1,500 words. Power. Dec. 4. 5 cts.

Electrically Operated Pumping Station at Rochester. Motor-driven centrifugal pumps served from central station lines are efficient in handling water over a large part of the city. By Sidney Alling and John H. Allington. 6 ills., 2,000 words. Electrical Review. Dec. 1. 10 cts.

Reservoirs.

Unusual Failure of Reservoir Roof at Pasadena. 800 words. Engineering & Contracting. Dec. 12. 10 cts.

Circular Reservoir Floor Built in Concentric Rings. Reinforced concrete slabs arch between circular shoulders which also support timber room columns. By C. E. Hasse. 1 ill., 800 words. Engineering News-Record. Dec. 13. 15 cts.

Treatment Plants.

Great Falls Water Purification and Softening Plant. Missouri river water is treated with sulphate of iron. The omission of lime is facilitated by thorough mixing. Softening; filtering; chlorine treatment. Appearance of the plant considered important. 3 ills., 3,000 words. Municipal Journal. Dec. 6. 10 cts.

Great Falls Purification and Softening Plant. By R. E. McDonnell. 4 ills., 1,500 words. Fire & Water Engineering. Dec. 19. 10 cts.

Manganese in the Water Supply of Pierre, S. D. 2-inch mains badly clogged. Aeration and milk of lime treatments proved effective in laboratory tests. By J. W. Sale. 1 ill., 2,000 words. Engineering News-Record. Dec. 6. 15 cts.

Waste Surveys.

A Water Waste Survey at White Plains, N. Y. By Carl P. Abbott. 1 ill., 1,000 words. American City. December. 50 cts.

Water Supplies.

The Water Supply of Battle Creek. Report of National Board of Fire Underwriters. 2,000 words. Fire & Water Engineering. Dec. 26. 10 cts.

Report of the Water Department of Billings. 1,000 words. Fire & Water Engineering. Dec. 5. 10 cts.

Annual Report of the Pasadena Water Department. 2,000 words. Fire & Water Engineering. Dec. 5. 10 cts.

STREET LIGHTING AND POWER.

Cooking.

Electrical Cooking as Applied to Large Kitchens. Descriptions of four installations in Newcastle, Eng. 3 ills., 5,000 words. By W. A. Gillott. Electrical Review. Dec. 29. 10 cts.

Lighting.

Street Lighting with Modern Illuminants. This article is practically a handbook on street illumination, covering both incandescent and arc lighting. It enables anyone to compare different units on the basis of illumination. It discusses the various factors entering into street lighting which should be thoroughly understood by all parties in order to avoid controversies later. By S. L. E. Rose and H. E. Butler. 14 ills., 2,000 words. General Electric Review. December. 20 cts.

Operation of Series Incandescent Lighting Circuits with Series Transformers. The series street-lighting transformer was developed for the purpose of furnishing a low-voltage lighting circuit where a high-voltage lighting circuit might be dangerous. The article analyzes the combined subject of grounding, operation and protection. By E. D. Treanor. 9 ills., 3,000 words. General Electric Review. December. 20 cts.

The Lighting of New York City's New $3,000,000 Garbage Disposal Plant. Describes the process of reducing 2,000 tons of garbage daily. The great number of pipes and belts made a satisfactory lighting system a problem requiring special attention. By A. O. Powell. 4 ills. 2,000 words. General Electric Review. December. 20 cts.

Saving in Municipal Lighting Data from Redding, Cal. By E. A. Rolison, city electrician. 3 ills., 1,000 words. American City. December. 50 cts.

Unusual Street Lighting Practice for Small Town. West Liberty, Ia., with a population of 1,700, spends $12,000 on street lighting with ornamental posts and underground service. 800 words. Electrical World. Dec. 15. 10 cts.

Mains.

Benches Back of Bells Hold Up Gas Main While Preparations for Lowering are Being Completed. Main allowed to settle down to new level by gradually digging out earth beneath it. Safety measures adopted. By Jos. Lucena. 2 ills., 1,000 words. American Gas Engineering Journal. Nov. 24. 10 cts.

Manholes.

Cost of Manholes on Street Lighting System. Details of labor and material. 1,000 words. Electrical World. Dec. 8. 10 cts.

Operation.

Wallingford Municipal Electric Works. Physical and financial condition of plant after 16 years of service. Rates have been reduced. Cooking with electricity has been promoted. 3 ills., 1,500 words. Municipal Journal. Dec. 6. 10 cts.

Practical Details in Burning Fuel Oil Under Boilers. Physical properties of fuel oils, method of handling, piping layouts, furnace designs and oil-burner details are presented. By Henry James Kennedy. 16 ills., 8,000 words. Engineering Magazine. December. 25 cts.

Fuel Saving Suggestions. By Chas. H. Bromley. 2 ills., 3,000 words. Power. Dec. 11. 5 cts.

Economies in Power-Pant Operation. Practical suggestions for increasing boiler and engine-room efficiency by proper operating methods. By F. N. Lawton. 6 ills., 2,800 words. Electrical Review. Dec. 8. 10 cts.

Services.

Providing Underground Service Connections Economically. Several types of service connections from underground distributing systems that reduced the investment and gave reliable results. By Edward B. Meyer. 12 ills., 3,500 words. Electrical Review. Dec. 1. 10 cts.

Service Extension Problems in California. Under general franchise utilities must pay cost within corporate limits. For rural work no rule exists. By J. F. Pollard. 3,000 words. Electrical World. Dec. 8. 10 cts.

FIRE.

Apparatus.

Motor Fire Apparatus in American Cities. A summary of data given in tables previously published. Chemical and hose with ladders the most popular kind of apparatus. 1,000 words. Municipal Journal. Dec. 15. 10 cts.

Mileage by Motor Fire Apparatus. Average number of miles run each year by the various kinds of apparatus. Reports from several hundred cities. 2½ pages. Dec. 15. 2½ pages. Dec. 22. 10 cts. each.

Fire Apparatus in Service. Table in this number, with those published in previous numbers, lists motor apparatus in about 500 cities. 3½ pages. Municipal Journal. Dec. 6. 10 cts.

Fire Apparatus Service. By Chas. A. Woodfield. 1,200 words. The Fire Engineer. December. 10 cts.

Gasoline Consumption by Fire Apparatus. Average miles run per gallon by each kind of apparatus in each of 250 cities. 2 pages. Municipal Journal. Dec. 29. 10 cts.

Speed of Fire Engines. Controversy at Anderson, Ind. 800 words. Fireman's Herald. Dec. 29. 5 cts.

General.

Reducing a City's Fire Waste; a Problem in Public Education. By Robt. Adamson, Fire Commissioner, New York. 3 ills., 2,000 words. American City. December. 50 cts.

The New York Fire College. What it is and what it has done. 4 ills., 1,000 words. Fire & Water Engineering. Dec. 12. 10 cts.

Utilizing Fire Departments for Fire Prevention Work. From a paper by T.

F. Baker. 1,500 words. Fire & Water Engineering. Dec. 26. 10 cts.

High Pressure Fire System of Cincinnati. For protection of 570 acres of high-value district a high pressure system has been installed. Special features. Flush hydrants are used. By J. A. Hiller, Supt. of Water Works. 4 ills., 2,000 words, Dec. 22. 4,000 words, Dec. 29. 10 cts. each.

MOTOR VEHICLES.

New Electric Truck Service Ready in Chicago. Commonwealth Edison Co. completes new electric service station and starts an innovation by rendering complete garage and maintenance service for commercial electrical vehicles. 4 ills., 3 500 words. Electrical Review. Dec. 29. 10 cts.

Supply of Power or Fuel to Vehicles on Public Highways. Discussion before Institution of Municipal & County Engineers 5,000 words. The Surveyor. Dec. 7. 40 cts

More Industries Testify to the Service of Good Roads and Motor Truck Haulage 2,200 words. Engineering News-Record. Dec. 6. 15 cts.

Freighting with Motor Trucks. Editorial remark on availability of motor trucks to handle freight over present highways. 1,000 words. Municipal Journal Dec. 6. 10 cts.

Highway Freight Train. Operation between Akron, O., and Boston, Mass. 1 ill., 500 words. Municipal Journal. Dec. 6. 10 cts.

Motor Trucks Loaded by Steam Shovel Do Well on Basement Excavation. 500 words. Engineering News-Record. Dec. 6. 15 cts

Automobile Thefts. By John Brennan, New York Police Department 1,000 words. American City. December. 50 cts

Industrial Trucks in Freight Congestion Relief. Electrically propelled trucks effect considerable saving in loading and unloading freight. 6 ills, 1,500 words. Electrical World Dec. 22. 10 cts.

Recent Developments in Motor Truck Hauling. Use of the motor truck in transporting materials over comparatively short distances. 5 ills. 1 000 words. Good Roads. Dec. 22. 10 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Garbage and Refuse.

Quantity and Quality of Garbage Lowered by War Conditions. Figures from Boston show marked reduction in amount of grease recovered from city wastes. 1 ill, 300 words. Engineering News-Record. Dec. 13. 15 cts.

The Effect of the War on the Production and Method of Disposal of Garbage. Effect has been to reduce quantity and quality, while disposal methods are being changed so that more garbage will be utilized From a paper by I. S. Osborne 2,000 words. Engineering & Contracting. Dec. 12. 10 cts.

The Profitable Dust Bin. Proposals for scientific utilization of refuse. 1,000 words The Surveyor Dec. 7. 40 cts.

Millions from City Garbage By J. P. Sebrieder, Bureau of Soils, Washington. 5 ills, 3 000 words. The American City. December. 50 cts.

Waste-Paper Collection in Glasgow. Some revenue is derived 700 words. Municipal Journal. Dec. 22. 10 cts.

Snow Removal.

Snow Removal in Boston. Both contract work and municipal forces are used By J. J. Norton, Supervisor of Street Cleaning. 2 ills., 1,000 words. American City. December. 50 cts.

Snow and Street Traffic. Editorial discussion. 1 000 words. Municipal Journal. Dec. 22. 10 cts

Street and Catch-Basin Cleaning.

Economy and Efficiency. Increasing efficiency in street cleaning. By W. H. Eccles. 1,200 words. The Surveyor. Nov. 2. 40 cts.

Motor Street Washing and Gulley Cleaning. Results with vacuum road washer. 800 words. The Surveyor. Nov. 2. 40 cts.

Catch-Basin Cleaning in Chicago. Auto-Eductor used. Cost for cleaning. 1 ill., 1,000 words. Municipal Journal. Dec. 29. 10 cts.

GOVERNMENT AND FINANCE.

Assessment Methods. From an address by A. G. Ludlow at Ontario Municipal Association. 1,500 words. Municipal World. December. 15 cts.

The Problem of Industrial Housing. By Leslie H. Allen. 6 ills., 4,000 words. Engineering Magazine. December. 25 cts.

BRIDGES AND DAMS.

Bridges.

Designing the 720-foot Metropolis Span. Simple span type and special steel used. Detailing to save weight. 6 ills, 3,000 words. Engineering News-Record. Dec. 20. 15 cts.

Comparative Designs of Plate Girder Viaducts. By O. H Ammann. 3 ills., 1,000 words. Canadian Engineer. Dec. 13. 15 cts.

Reinforced Concrete Construction. Floor slabs. 3 ills., 800 words. The Surveyor. Nov. 9. 40 cts.

London County Council's First Ferro-Concrete Bridge. Design and construction. 4 ills., 1,600 words. The Surveyor. Nov. 9. 40 cts.

Under-Crossing Wing Wall Designed to Limit Base Pressure. Box culverts form main tunnel and wing walls and floors built of slabs cut to permit earth to fall through. 1 ill, 1,000 words. Engineering News-Record. Dec. 6. 15 cts.

Protecting Submerged Steelwork of Bridge. Ends of steel arches submerged by dam, to be protected by enclosure wall and encasement with pitch. 4 ills., 1,100 words. Engineering News-Record. Dec. 27. 15 cts.

Methods of Protecting Steel Work of Marshall Ave. Bridge, St. Paul, from High Water. 6 ills, 1,000 words. Engineering & Contracting. Dec. 26. 10 cts.

Some Reflections on the Architecture of Bridges. Translated from the French by G B. Steinman. 1,500 words. Engineering & Contracting. Dec. 26. 10 cts.

Tramway and Traveling Chutes Distribute Concrete on Large Arch Bridge Methods of construction. 9 ills., 1,100 words. The Contractor. Dec. 21. 10 cts

Cost-Cutting Form Design for Concrete Deck on Steel Viaduct. Cantilevers built in 8-foot sections. Forms between girders very simple. 5 ills, 1 000 words. The Contractor. Dec. 21 10 cts.

Dams.

Arch-Dam of Sharpest Radius nears Completion. Motor trucks haul material 7 miles to dam site. 1 ill, 1,000 words. Engineering News-Record. Dec. 6. 15 cts

The Effect of Intrusive Waters on the Stability of a Masonry Dam. 4 ills., 4,000 words. Canadian Engineer. Dec. 6. 15 cts

La Loutre Dam Across St. Maurice River Complete Site up river 50 miles from nearest railway caused transportation difficulties. Construction finished before contract time. By Chas. Luscombe, resident engr. 13 ills., 2,500 words. Canadian Engineer. Dec. 27. 15 cts

Five Million Yards Moved to Dam Three Rivers Hydraulic fills were made between outside embankments. Flow of two watersheds diverted on third 5 ills., 2,200 words. Engineering News-Record. Dec. 27. 15 cts.

STRUCTURAL MATERIALS.

Notes on the Use of Concrete. By A. E Eastman 2 ills., 1 500 words. Canadian Engineer. Dec. 20. 15 cts

Concreting in Winter. Cold weather precautions add $1.25 per cu yd to cost of bridge job at Ames, Ia 1,000 words. Concrete. December. 20 cts

The Corrosion of Iron and Steel with Special Reference to Reinforced Concrete. By J. Newton Friend 3 ills., 1,800 words. The Surveyor. Nov. 30. 40 cts.

Does Waterproofed Concrete Resist Sea Water? Letters from Toch Bros. and R. J Wig and L. R Ferguson. 1,000 words Engineering News-Record. Dec. 27. 15 cts.

Stone in Engineering Work. 2,500 words Stone. December. 15 cts.

Drilling and Blasting Sandstone. 2,000 words. Stone. December 15 cts.

MISCELLANEOUS.

The Effect of the War on Municipal Engineering and Public Health. By H. Percy Bulnois. 2,500 words. The Surveyor. Oct. 26. 3,000 words. Nov. 2. 40 cts. each.

Engineering Application of Geology. Knowledge of foundation conditions valuable. By W. J. Dick. 11 ills., 2,500 words. Canadian Engineer. Dec. 6. 15 cts.

Reducing Construction Costs by Increased Efficiency. By W. Huber, Asst. Engr., Dept. of Public Highways of Ontario. 4,000 words. Better Roads & Streets. December. 15 cts.

How Contractor Keeps Tabs on the Job. Forms used to record progress, time, and costs, in concrete building construction. 2 ills., 800 words. Concrete. December. 20 cts.

"Cost-Plus" Contract Forms of Fred T. Ley & Co., Inc., Hurley-Mason Co. & Ferro Concrete Const. Co. 6,000 words. Engineering & Contracting. Dec. 26. 10 cts.

How Construction was Speeded Up by Doing Three Jobs at One Time. In increasing the height of three dams, a flexible system was used to permit concentration of labor at critical points on the work. 4 ills., 3,000 words. Engineering News-Record. Dec. 6. 15 cts.

Administrative Work at Camp Merritt. Organizing the force and coordinating all branches of work to secure completion in three months. 5 ills., 2,250 words. Municipal Journal. Dec. 22. 10 cts.

Camp Merritt as a Construction Problem. Building water supply, sewerage, refuse disposal, fire protection, street lighting, theaters, restaurants, hospitals and other necessities, besides barracks and others quarters for 30,000 men in three months. 7 ills., 3,000 words. Municipal Journal. Dec. 15. 10 cts.

Locomotive Crane Sprang from Small Beginnings. Grab-bucket and many uses open up wide field. Three different types of power common. By James Shearer. 5 ills., 3,000 words. Engineering News-Record. Dec. 6. 15 cts.

Design of Special Slide Rules. Second installment. By A. Lewis Jenkins. 10 ills., 2,000 words. Engineering Magazine December. 25 cts.

Mixing Sand and Gravel Before They Go to the Mixer. 1 ill., 600 words. Engineering News-Record. Dec. 13. 15 cts.

Handling Sand, Gravel and Broken Stone by Portable Conveyors. 20 ills., 500 words. Engineering & Contracting. Dec. 19. 10 cts

Home-Made Dredge Reduces Cost of Canal Construction. Crew of 2 men excavates 35 cubic yards per hour with a small suction machine of unusual design. 2 ills, 1,200 words. Engineering News-Record Dec. 20. 15 cts.

Dragline Eliminates Haulage Equipment on Railroad Work. By W. A. Pillans. 1 ill, 1,000 words. The Contractor. Dec. 21. 10 cts.

Precast Units for Sea Wall Construction 2 ills, 800 words. Concrete. December. 20 cts.

Lines and Grades in Tunnels of Small Diameter. From a paper by Henry D. Pratt. 1 ill, 1,300 words. Canadian Engineers. Dec. 13. 15 cts.

PERSONALS

Daniels, Francis E., assistant engineer with the Pennsylvania state department of health, has accepted a commission as captain in the Sanitary Corps of the National Army. He has been assigned for duty to Camp Greene, Charlotte, N. C. Captain Daniels is the author of "The Operation of Sewage Disposal Plants."

Uhler, William D., chief engineer of the Pennsylvania state highway department, has been commissioned a major in the Ordnance Reserve of the United States Army, to report at once. It is Mr. Uhler's intention, as far as possible, to keep in touch with the work of the state highway department. Mr. Uhler was appointed chief engineer in 1915. From 1890 to 1895 he was connected with the engineering department of the Lehigh Valley Railroad, leaving there to enter the employ of the Queen Anne's Railroad, where he remained for eight years in various capacities from assistant engineer to general manager and chief engineer.

(*Continued on page 47*)

NEWS OF THE SOCIETIES

Calendar of Meetings.

Jan. 12.—NORTHWESTERN SOCIETY OF HIGHWAY ENGINEERS. Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 14.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York City. Secretary, F. A. Molitor, 35 Nassau street, New York.

Jan. 15-17.—VIRGINIA GOOD ROADS ASSOCIATION. Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 16-17.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, New York City. Secretary, Charles Warren Hunt, 29 West 39th street, New York.

Jan. 21-23. — MONTANA INSTITUTE OF MUNICIPAL ENGINEERS. Annual convention, Bozeman, Mont. Secretary-treasurer, Roy E. Malsor.

Jan. 22-24.—AMERICAN WOOD PRESERVERS' ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, F. J. Angier, B. & O. Railroad, Mt. Royal Sta., Baltimore, Md.

Feb. 4-7.—AMERICAN ROAD BUILDERS' ASSOCIATION. Fifteenth annual convention, Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Road Builders' Association.

Among those who have been asked to present papers or make addresses at the Eighth American Good Roads Congress to be held at the Hotel Statler, St. Louis, Mo., February 4 to 7, 1918, under the uspices of the American Road Builders' Association, are H. G. Shirley, chief engineer of the Maryland State Roads Commission; W. A. Welch, chief engineer of the Palisades Park Commission; William D. Uhler, chief engineer of the Pennsylvania State Highway Commission; R. D. Chapin, chairman of the Highways Transport Committee; Clifford Older, chief highway engineer of the Illinois Department of Public Works and Buildings; and W. S. Gearhart, state highway engineer of the Kansas State Highway Commission.

It is also hoped that Secretary of War Baker and Secretary of the Treasury McAdoo will be able to make addresses.

The program is in course of preparation and, up to this time, the following tentative subjects have been selected:

"A Study of the Relative Efficiency of Motor Trucks as Affected by the Length of Haul."

"The Value of Improved Roads for Motor Truck Transportation as Auxiliary to the Railroads."

"Necessity for Uniformity in Motor Truck Legislation."

"Roads in the Hudson River District with Unusual Construction Features."

"The Necessity for the Immediate Development of Commercial Roads That Are of Military and Strategic Advantage."

"Surety Bonds for Highway Purposes."

"A State Highway Department as a Contractor."

"Massachusetts' Scheme for Contractors."

"New Features in Design and Construction of Earth, Sand Clay, Gravel and Waterbound Macadam Roads and Pavements."

"New Features in Design and Construction of Bituminous Roads and Treatments, and Cement Concrete Roads and Pavements."

"New Features in Brick, Wood Block and Stone Block Pavements."

"New Features in the Maintenance, Reconstruction and Repair of Earth, Sand Clay, Gravel and Waterbound Macadam and Bituminous Roads, Penetration Method."

"New Features in the Maintenance, Reconstruction and Repair of Bituminous Roads, Mixed Method; Cement Concrete; Wood Block; Brick and Stone Block Pavements."

"How to Lay Out and Justify a War Program for the Building of Roads."

New Jersey State League of Municipalities.

Railroad traffic delays seriously handicapped the opening of the third annual convention of the New Jersey State League of Municipalities, which was held on Jan. 3 and 4 at Trenton, with headquarters in the commission chambers of the Municipal building. When the opening session was called to order by mayor George N. Seger of Passaic, there were only about thirty present. The president of the league, mayor F. W. Donnelly of Trenton, was absent, being weatherbound off the coast of Georgia. Mayor Seger read mayor Donnelly's address, which reviewed the work of the league.

Claude H. Anderson, Princeton, reviewed the work of the Bureau of Municipal Information, of which he is director, and outlined a plan for stimulating effective action by the cities on pending state legislation. A number of reports from the various departments and committees were then read. These committees consider the following subjects: State legislation; charters; home rule; taxation and assessment; franchises and public utilities; municipal ownership; judicial decisions; parks, playgrounds and city planning; health and sanitation; public safety; water works and supply; municipal accounting; light and power, and street paving.

The opening session was brought to a close by the election of officers for the ensuing year. Mayor George N. Seger of Passaic was elected president. Other officers chosen were as follows: First vice-president, mayor Calkins of Plainfield; second vice-president, mayor W. F. McAllister of Merchantville; third vice-president, commissioner Thomas L. Raymond of Newark; secretary-treasurer, Clinton J. Swartz of Trenton. In addition to these officers other members of the executive committees were chosen as follows: Commissioner Frank Hague of Jersey City, mayor C. E. F. Hetrick of Asbury Park, mayor Harry Bacharach of Atlantic City, mayor Daniel A. Garber of Ridgewood, mayor Victor Mravlag of Elizabeth, mayor Washington Wilson of Metuchen and mayor J. P. Potter of Clayton.

At a luncheon conference there was a roll call and each delegate made a three-minute speech on "The Most Important Accomplishment of My City in 1917."

At the afternoon session, with mayor Calkins of Plainfield presiding, the delegates discussed the general subject of "Municipalities and the War." Commissioner T. L. Raymond of Newark spoke on "The Relation of the New Jersey State League of Municipalities to the New Jersey State Council of Defense." Governor Walter E. Edge spoke on "Municipalities During the War," referring to the necessity of retrenchment and the safe limits for such action. Clinton Rogers Woodruff spoke on "Municipalities After the War."

The general subject of a dinner conference in the evening was "The Cities' Allies." The helpful cooperation of Princeton University and Rutgers College was discussed. Jesse Lee Bennett of Baltimore spoke on "Constructive Publicity as an Ally to the City" and Howard Hughes, librarian, of Trenton, discussed "The City Library as an Ally in Educating Adult Citizens and Aliens."

After the dinner, the general subject, "Improved Municipal Administration," was taken up. Dr. Delos F. Wilcox, New York city, read a paper on "The City's Part in the Development and Control of Public Utilities," followed by discussion led by Geo. L. Record of Jersey City and commissioner J. R. Fell of Trenton. Richard S. Childs of New York addressed the meeting on "The Proposed City Manager Amendment to the Walsh Act," which was discussed by Spaulding

Frazer, Newark, and mayor John F. Ten Broeck of Perth Amboy.

The next morning's session was held in the State Street Theatre. Here G. V. Branch, office of Markets and Rural Organization, U. S. Department of Agriculture, spoke on "Municipal Public Markets" and Alfred N. Chandler, Newark, on "Scientific Taxation for Municipal Revenue," both giving illustrated addresses. "The Locked Door," a three-reel Vitagraph motion picture on fire prevention, was shown by courtesy of the New York fire department and the Underwriters' Laboratories.

The luncheon conference took up "The Needs of Our Small Municipalities." Mayor W. F. McAllister, Merchantville, discussed "Practical Methods for Increasing Efficiency in Our Small Municipalities," and W. D. McGuire, Jr., New York, spoke on "Regulation of Commercial Amusements." Edward Grosscup, state purchasing agent, addressed the meeting on "Municipal Purchasing to Save Money." Discussion was led by mayor Washington Wilson of Metuchen and mayor C. G. Justice, Pitman, and township committeeman A. E. Burling, Pennsauken township.

"Municipal Finance and Taxation" was the theme of the final session, presided over by mayor Daniel E. Garber of Ridgewood. Dr. Ralph E. George, Whitman College, Walla Walla, Wash., spoke on "The Recent Finance Legislation of New Jersey." Walter R. Darby, State Commissioner of Municipal Accounts, reviewed "Nine Months' Experience With the Municipal Finance Laws." Hon. Arthur N. Pierson, Westfield, made an address on "Revision of New Jersey Tax and Pension Laws." Joseph Kinzley, Jr., Hackensack; commissioner Albert Beyer, Atlantic City, and commissioner James F. Gannon, Jr., Jersey City, led the discussion. Milton Wend, Washington, D. C., discussed the work of the U. S. Bureau of Standards.

Highway Traffic Association of New York State.

A public meeting of the Highway Traffic Association of the State of New York will be held in the Assembly Hall of the Automobile Club of America, 247 West 54th street, New York City, at 8.30 p. m., Tuesday, Jan. 15.

Mr. Roy D. Chapin, chairman of Highways Transport Committee of the Council of National Defense will speak on the work of his committee. The topic of general discussion will be "Practical Methods of Relieving Terminal Freight Congestion in New York City."

The meeting will be preceded by a dinner served in the grill room of the club at 7 p. m.

American Institute of Electrical Engineers.

The 336th meeting of the American Institute of Electrical Engineers is being held as an intersectional meeting in Boston, New York and Chicago, the same paper being presented at the three meetings. The paper is "Effects of War Conditions on the Cost and Quality of Electric Service" by Lynn S. Goodman and William B. Jackson, the former having presented the paper in Boston Jan. 8 and in New York Jan. 11, and the latter being scheduled to present it in Chicago Jan. 14.

PERSONALS

(*Continued from page 45*)

In 1904 Mr. Uhler became county roads engineer of Caroline County, Maryland, serving four years, after which he was appointed to be engineer in charge of maintenance of the Maryland state roads commission. He resigned this position in 1912 to become principal assistant engineer of the Bureau of Highways in the City of Philadelphia. Mr. Uhler is a member of the American Society of Civil Engineers, the American Road Builders' Association, the Engineers' Club of Philadelphia, the Engineers' Club of Baltimore, the Engineers' Society of Harrisburg, the American Society for Testing Materials, the American Society of Municipal Improvements and the American Concrete Institute. At its recent meeting in Richmond, Virginia, Mr. Uhler was elected president of the American Association of State Highway Officials.

Conwell, J. S., president of the city council of Los Angeles, Cal., died suddenly on Dec. 15, while on a return to the city from Phoenix, Ariz., where he had gone on a rest and pleasure trip.

Hulley, E., is the new mayor of Marion, Ind. He was previously in the service of the city for 19 years, having served as waterworks superintendent from 1898 to January, 1917.

Kracke, F. J. H., former commissioner of Plant and Structures, New York city, has been appointed by Governor Whitman to succeed commissioner William Hayward, now in war service, on the public service commission for the First District. Charles Bulkley Hubbell was appointed to succeed Henry W. Hodge, now in France as an army engineer. The personnel of the commission is now complete.

Petrie, Thos. E., who has been in the service of the city of Marion, Ind., for 15 years, has again a place as president of the board of public works. He was city engineer from 1902 to 1917, holding office in addition as street superintendent from 1907 to 1914 and member of the board of public works from 1910 to 1914.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Sheboygan, Wis., is to build a BRIDGE, plans for which are being prepared by the engineers, Klug & Smith.

Ontario, Ont., is to improve its WATERWORKS, plans for the work being in course of preparation by the engineer, L. C. Kelsey.

Andrew County, Savannah, Mo., is constructing a ROAD and BRIDGES, plans being in course of preparation by the engineers, Leslie & Barnes.

A bond issue election is to be held by Martinez, Cal., on the question of building a WATER SYSTEM and SEWERS. The firm of Olmsted & Gillelen has drawn the preliminary plans.

Cascade County, Great Falls, Mont., is to vote on a bond issue for constructing two BRIDGES. The consulting firm, the Tolz Engineering Co., is to prepare plans for the structure.

Houston and Geneva Counties, Ala., are making extensive HIGHWAY IMPROVEMENTS, including construction of BRIDGES. The engineers for the work are the firm of Heller & Mickle.

An $800,000 HYDRO-ELECTRIC DEVELOPMENT is contemplated by the city of Everett, Wash. The consulting engineering firm of Burns & McDonnell has been engaged to prepare plans for the improvement.

Ford, Mich., is to extend its SEWER SYSTEM according to plans prepared by Mason L. Brown & Sons.

Aitken County, Aitken, Minn., is to build a ROAD BRIDGE, the engineers for the improvement being the Minneapolis Bridge Company.

SEWERS are to be built by the village of Butterfield, Minn. The plans and specifications are being prepared by the firm of Krall & Krall.

A SEWER SYSTEM is to be built by Waitsburg, Wash. Plans and specifications for the improvement are in process of preparation by the engineer, G. L. Sayer.

Falls City, Neb., is to improve its WATERWORKS and LIGHT PLANT following a bond issue election. E. M. Stevens is the engineer drawing the preliminary plans.

The Arkansas-Louisiana highway improvement district, Desha County, Ark., is to build 42 miles of macadam and 112 miles of asphalt ROAD. The engineers for the work are Ford & McCrea.

The REBUILDING of the devastated areas of Halifax, N. S., will include the layout of streets, construction of sewers, buildings, docks and piers. All the engineering and construction work on the project has been placed in the hands of the Hedden-Pearson-Starrett Company.

INDUSTRIAL NEWS

Course of Cast Iron Pipe Prices.

The accompanying charts and table record the course of prices for the past 15 years on 6-in. cast-iron water pipe, f.o.b New York, in carload lots, per ton of 2,000 lb. The prices for the first ten years were furnished by Daniel Runkle, at that time with the Warren Foundry & Machine Co., 11 Broadway, New York, and for the remainder of the period covered were averaged from weekly quotations in The Iron Age:

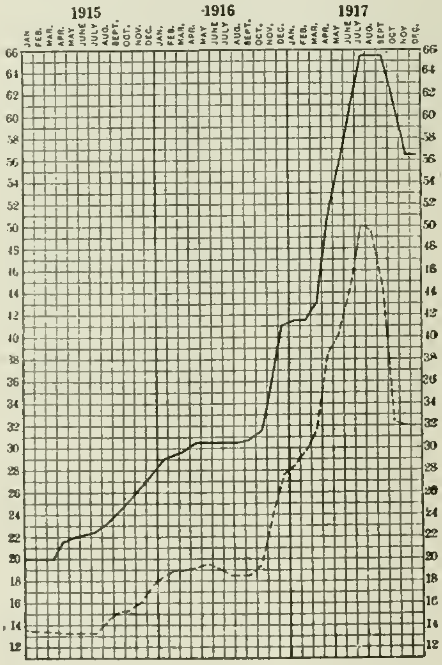
	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917
January ..	$27.50	$21.75	$24.50	$29.25	$24.50	$28.00	$29.75	$34.25	$27.00	$24.50	$25.50	$22.00	$22.00	$25.00	$22.00	$20.00	$29.00	$41.50
February .	26.75	22.25	25.00	29.25	24.25	28.50	29.50	34.25	26.75	24 25	25.50	21.50	22.00	24.75	22.00	20.00	29.33	41.50
March ...	26.75	21.50	26.25	30.75	24.25	26.75	30.50	34 00	26 25	25.25	25.50	21.00	22 00	23 87	22 00	20.00	29.75	43.10
April	26.50	22.00	26.00	31.00	24.25	27.00	29.75	33.50	26.25	25.00	25.50	21.00	21.25	23.50	22.00	21.60	30.50	50.88
May	26.00	22.25	27.75	30.75	24.00	27.25	31.00	34.25	26 25	25 25	25.50	21.00	21.00	23 00	20.88	22.00	30.50	55.50
June	24 50	23.00	28.00	30 75	23.50	27.25	32.50	33.50	25.75	26.00	25.25	21.00	21.00	23.00	20 50	22 25	30.50	60.75
July	24.75	23.75	28.50	30.75	23.50	27.25	30.25	34.00	25.75	26.25	24.00	21.00	22.10	23 00	20.50	22.50	30.50	65.50
August ..	23.50	23.75	29.50	29.50	23.50	27.75	30.50	32 50	25.25	26.00	23.50	21.00	22.00	23.00	20.50	23 25	30 50	65.50
September.	22 25	23.50	29.50	29.00	23.00	27.25	31.00	33.00	25.75	25.75	23.50	21.00	23.12	23 00	20.40	24.37	30.83	65.50
October ..	21.75	24.00	29 50	26.00	23.25	28.25	33.00	33.50	25.75	25.50	23.00	21.00	24.50	23.00	20.00	25.25	31.50	61.00
November .	21.75	24.50	30 75	24.50	25.00	29 00	33 25	28 50	25.00	25.87	22 12	21.40	24.12	23 00	20 00	26.50	35.50	56.50
December .	21.75	23.75	29.25	24.25	27.00	29.25	35.50	28.00	25.50	25.70	22.00	22.00	24.62	22.33	20.00	27.60	41.00	56.50

The other curve in this chart shows prices on gray forge pig iron at Philadelphia and vicinity, as gray forge is largely used in making pipe, and this shows how closely cast-iron pipe prices follow the fluctuations in pig iron. These prices, on which this curve is constructed, also going back to 1900, have been averaged from weekly prices in The Iron Age. Prices for the past three years have been plotted on a large scale to show in greater detail the striking increase on pipe and pipe iron costs caused by war conditions, particularly during the past year.

Cast Iron Pipe.—Prices remain constant after the recent price-fixing by the government. Quotations: Chicago, 4-inch, class B and heavier, $57.35; 6-inch, $54.35. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.25. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49.

President's Prices on Iron and Steel. The President has approved the recommendation of the War Industries Board that the maximum prices heretofore fixed by the President upon the recommendation of the board upon ore, coke, pig iron, steel, and steel products, subject to revision on January 1, 1918, be continued in effect until March 31, 1918. No new contracts calling for delivery of any of said commodities or articles on or after April 1, 1918, are to specify a price unless coupled with a clause making the price subject to revision by any authorized United States Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime. It is expected that all manufacturers and producers will observe the maximum prices now fixed.

The United States Rubber Company, New York City, N. Y., announces that the selling forces of all its subsidiary companies manufacturing mechanical goods are now centralized in one organization. The change involves seven companies, each separately manufacturing and selling various articles of mechanical rubber goods. In addition to centralizing the selling forces the reorganization co-ordinates production. Headquarters of both the distribution and production organizations are in the United States Rubber building in New York City. According to E. S. Williams, vice-president of the United States Rubber Company, in charge of the mechanical goods division, the consolidation will make possible a more efficient and expeditious service. The companies involved in this reorganization are the Revere Rubber Company, the Peerless Manufacturing Company, the Mechanical Rubber Company of Cleveland, the Mechanical Rubber Company of Chicago, the Sawyer Belting Company, the India Rubber Company and the Eureka Fire Hose Manufacturing Company.

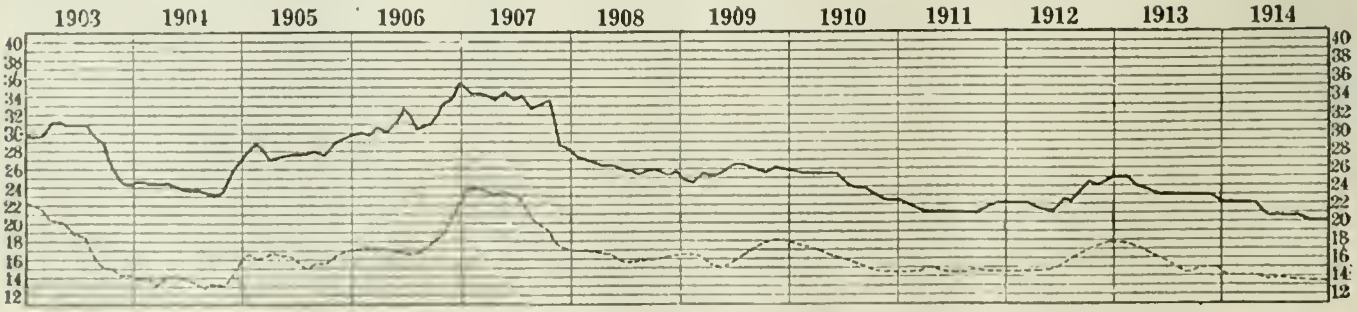


WAR-PERIOD FLUCTUATION OF NEW YORK CAST IRON PIPE PRICES.

Catalogs Wanted. — The Western Service Co., Spencer, Ia., has been organized to engage in consulting civil and electrical engineering and power plant efficiency practice. The company wishes to receive catalogs and data of materials and appliances in the fields of their practice for reference.

The Southern Pine Association will hold its annual meeting Feb. 19 and 20 in New Orleans, La., with headquarters at the Hotel Grunewald.

The Goodyear Tire & Rubber Co., Akron, O., announces that P. W. Litchfield, its vice-president and factory manager, has been appointed by the Rubber Association of America, a member of the War Service Committee. This committee represents the rubber industry in its cooperative relations with the government, looking to the carrying out of the government's program, as far as it affects the rubber manufacturers of the country.



COURSE OF NEW YORK PRICES OF CAST-IRON PIPE (AND PHILADELPHIA PIG IRON).

Municipal Journal

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SNOW REMOVAL IN ROCHESTER

Methods Recommended for Use by the Department of Public Works—Methods Previously Employed—Provision for Sleigh Traffic—Snow Fighting—Use of Sewers—Panning and Snow Plowing—Cleaning Crosswalks.

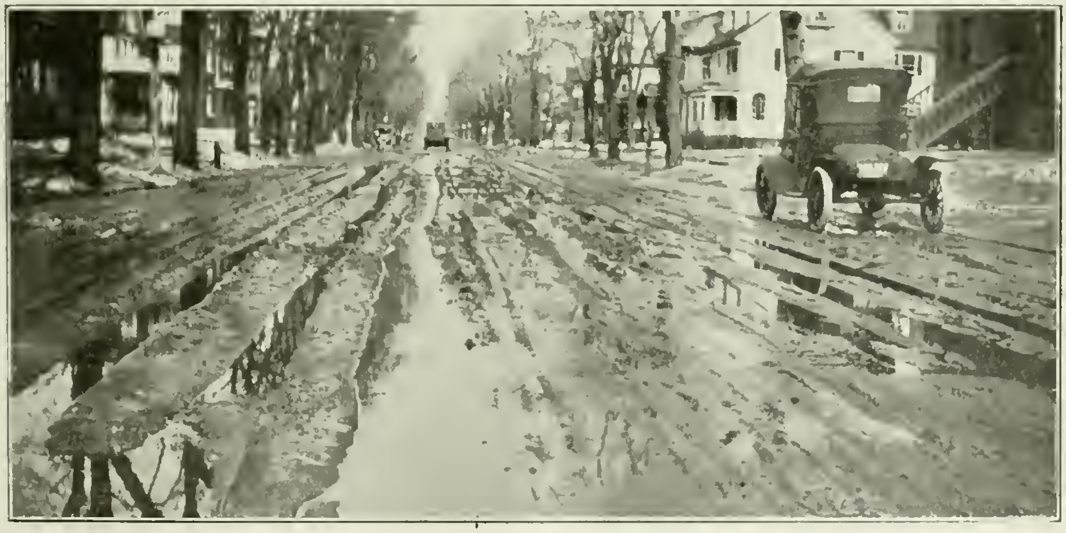
The Rochester, N. Y., Bureau of Municipal Research was incorporated in April, 1915, for a two-fold purpose—"To get things done for the community through cooperation with persons who are in office, by increasing efficiency and eliminating waste.—To serve as an independent non-partisan agency for keeping citizens informed about the city's business."

A few weeks ago it submitted to the mayor and commissioner of public works a report upon the problem of snow removal in the city, based upon a study made by John T. Child, assistant engineer, working under the supervision of James W. Routh, chief engineer. Before the publication of the report, the commissioner of public works "signified his intention to accept and adopt practically all of the recommendations made in the report and has already taken steps to put these recommendations into effect during the coming winter. * * * The commissioner has shown a spirit of genuine cooperation, and both the Department of Public Works and Bureau of Municipal Research anticipate that this winter's work will be attended by better results than ever before obtained in Rochester."

The report does not attempt to develop a plan of snow removal in minute detail, but rather points out the weakness of some of the past methods and suggests a general plan by which the service can be improved. This plan includes—"1. A reorganization of the street cleaning forces of the Department of Public Works, including the entire existing forces employed for street cleaning and refuse collection, and a combination of these services in a Division of Sanitation. 2. A redistricting of the city and a redistribution of the work to be done. 3. The designation of a down-town district from which snow will be removed as it falls, and from which all sleigh traffic will be diverted. 4. Certain specific changes in methods and equipment."

Reference to the sleigh traffic calls attention to the fact that the problem in Rochester differs in many respects from that in the cities further south where the snow fall is light or where the wheel traffic so quickly cuts up the snow down to the roadway that the use of sleighs within the city limits is practically impossible. In Rochester the use of sleighs for all kinds of traffic appears to be more or less general, and only one main street and one or two blocks each way from it on the intersecting streets in the business part of the city are to be cleaned, all other streets being left in a condition practicable for use by sleighs, even to the extent of leaving snow on the crossings where these streets intersect those which are to be cleaned; the latter being especially necessary where the sleighing streets cross street railway tracks in order to prevent trucking sleighs from being stalled as they cross the tracks.

Four pages of the report are occupied with a summary of the recommendations. Many of these have only local interest; others possess no novelty for those who are



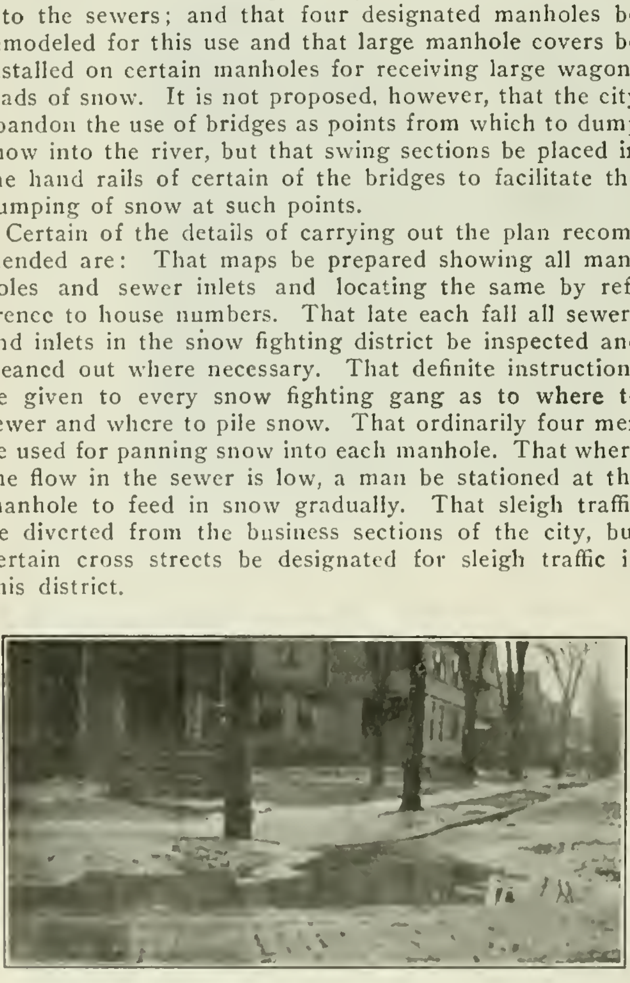
RUTS IN ICE-COVERED STREET IN ROCHESTER WHERE NO DRAINAGE IS PROVIDED.
Automobiles are unable to turn out of deep ruts of this kind. Chained wheels cut through these ruts and damage asphalt pavements.

familiar with the business of street cleaning, but some of the more interesting ones will be referred to.

Most of the teams used in snow removal are hired by the day and it has been found that drivers prefer to furnish sleighs rather than dump wagons, partly because the sleighs find easier going through the snow than do the carts, and partly, perhaps, because the horses can rest while the sleighs are being unloaded by hand, while the dump wagons can drop their load in a few seconds. For this latter reason it is recommended that preference be given to dump wagons rather than to sleighs and that the daily rate for teams be reduced 50 cts. when sleighs are used.

In several respects the methods adopted by New York City and previously described in Municipal Journal are recommended for Rochester, among these being that of compiling before the winter a list of available men and teams, classifying these according to police precincts, and arranging with the police patrolmen to notify men and teamsters when their services were wanted for snow removal. Another is the recommendation of snow fighting rather than snow removal—that is, beginning to remove the snow as soon as it reaches a depth of two or three inches and thereafter remove it as fast as it falls. For this purpose it is recommended that increased use be made of the sewers, and that snow be removed by hand, by pans or scrapers, by which it is pushed directly into the manhole openings. Also that snow removal wagons be dumped into such openings and that the use of sewers be continued beyond the emergency period of storms. In this connection it is recommended that ice be dumped only in certain specified manholes; that snow and ice mixed with mud be dumped only into the river and not into the sewers; and that four designated manholes be remodeled for this use and that large manhole covers be installed on certain manholes for receiving large wagonloads of snow. It is not proposed, however, that the city abandon the use of bridges as points from which to dump snow into the river, but that swing sections be placed in the hand rails of certain of the bridges to facilitate the dumping of snow at such points.

Certain of the details of carrying out the plan recommended are: That maps be prepared showing all manholes and sewer inlets and locating the same by reference to house numbers. That late each fall all sewers and inlets in the snow fighting district be inspected and cleaned out where necessary. That definite instructions be given to every snow fighting gang as to where to sewer and where to pile snow. That ordinarily four men be used for panning snow into each manhole. That where the flow in the sewer is low, a man be stationed at the manhole to feed in snow gradually. That sleigh traffic be diverted from the business sections of the city, but certain cross streets be designated for sleigh traffic in this district.



CROSSWALK CLEARED BUT NO DRAINAGE PROVIDED.
Melting snow causes water to stand on crossings.

A well thought-out plan for fighting snow should be prepared beforehand and all of the officers instructed in it, definite areas and certain dumps being allotted to each gang beforehand. Printed rules and instructions should be prepared and supplied to all regular employees on the snow fighting force.

A knowledge of costs is essential to obtaining results and employing the methods best adapted to local conditions. Heretofore no such costs have been kept in Rochester.

"Experience elsewhere has proved that the size of a sewer for snow removal is of much less importance than the depth and velocity of flow. It has been proved by trial that the detrimental results of street dirt entering a sewer used for this purpose are less than those from dirt normally washed in by rain and street flushing, because of the increased flow from melting snow and the carrying power of the snow itself, much of which has been found to float from one to three blocks before melting. Organic street dirt soon disintegrates and the mineral matter is carried along by the increased flow. * * * Temperature does not appear to be an important factor because, if the volume of water is sufficient to carry off snow, the reduction of temperature is slight, and warmer water is constantly flowing in."

Dumping ice into sewers is recommended only where the manholes are directly over the sewer and the normal flow is 12 inches or more in depth. Such depth is sufficient to float off chunks of ice removed from streets. (This was tried out and proved last winter by dumping wagon loads of ice chunks into certain manholes.) The smallest sewer into which ice dumping is recommended in Rochester is one of 50 x 54 inches.

Wide experience elsewhere has shown that it is impossible to clog up a sewer by filing a manhole with snow, for the sewage will seep through and flow underneath the snow.

Because of the poor class of labor used, it has proved necessary elsewhere to do snow panning by gangs, especially when night work is done. Usually about four men can pan into one manhole, and from eight to twelve can be handled in a block by one foreman or squad leader.

The contents of a three-yard wagon can be unloaded and shoveled into a sewer in from 50 to 90 seconds, and the contents of a five-yard wagon in about 2½ minutes. It takes from three to five minutes to unload these wagons onto the bridges and then shovel the snow into the river.

As in some other cities, the street railway company is under certain obligations as to removal of snow, the essential requirement being that it must either do or pay for half the snow work on streets occupied by its tracks. It is recommended that the company and city agree upon an arrangement by which the railway company would be entirely responsible for the entire width of certain streets (presumably half of the streets occupied by its tracks) and the city be entirely responsiblee for the remaining street railway area. It is recommended that the railway company be allowed to use city sewer manholes for dumping snow, provided a city inspector be continuously at the manhole to see that improper materials are not dumped into the sewer, this inspector to be paid by the railway company. Also that the street railway company place wings upon the snow plows to push back the snow as far as possible on all streets outside of the panning area; this serving as a preliminary plowing by which the snow is pushed into windrows along the sides of the streets.

Commenting more at length on some of the present practices and proposed changes, the report states that the laborers now employed on street cleaning and refuse collection are hired by the day and paid by the hour, many of them being given only a few days' work each week and never knowing in advance how long their services will be desired. "Such a practice is to be commended as charity but can hardly be supported from the standpoint of effective service. The hiring of men by the day can result at best only in a loosely formed organization composed of men either unable to do a full day's work or who accept work with the city merely as a temporary expedient. * * * There is great scarcity of labor, and such labor as is merely picked up from time to time is inefficient, unreliable and demands a disproportionately large amount of supervision. If snow fighting is to replace snow removal, a permanent force is essential, for the men must be trained in snow fighting in order to make this method effective. * * * The employment of a permanent force also will make possible a code of discipline whereby a system of merits and demerits can be used to increase the personal efficiency of the men. The necessity for a distinctive garb for men engaged in street cleaning work is well recognized, but experience has proved in Rochester that it is impossible to obtain a uniformed force without providing regular employment for the men."

Concerning the appliances used, it is recommended that the rear-dump garbage wagons now owned by the city be used for snow work during the winter; that snow plowing be employed in connection with snow panning; that two motor flusher trucks be used for snow plowing during the winter, and that these plows be used in particular to level ruts on streets, which ruts are difficult for automobiles to turn out of and result in serious damage to the pavements along the ruts. The city was contemplating the purchase of two self-dumping motor trucks and it was recommended that these be used for snow plowing and for long hauls; also that the incinerator truck be used for long hauls only. The latter has a flat box 7 feet wide and is not of the dumping type, and it takes four strong men from 16 to 19 minutes to unload the truck by hand, while its width makes it difficult to load in the street without interfering with traffic. Its use, therefore, should be confined to long hauls where its snow capacity of 14½ cubic yards makes for economy in hauling. It is also recommended that guards, known as ring guards, be provided for the manholes. These guards were invented and tried out by the department last winter and have proven entirely satisfactory, both as a safety measure and in breaking up lumps of snow. They cost from $1.00 to $1.50 each. (The editor has seen some of these in use in New York City, whose officials probably obtained the idea from Rochester.)

"A type of snow plow for use on the front of trucks, one of which has recently been purchased for use in Rochester, has been used extensively in other cities. It has been found in Philadelphia that the 'Good Roads' A-frame snow plows can be used satisfactorily in this way, and that no damage has been done to the front axles of the trucks because the jar is taken up by the chassis frame. It is unnecessary to brace the plow back of the front axles. These plows can be used for plowing to within half inch of the pavement in snow up to 6 inches or 8 inches in depth and for bucking drifts, but not for loosening compact snow or ice. The New York Department of Street Cleaning uses a large number of this type of plow on tractors. It is stated that when the blade hits an obstruction it tips forward and dumps its load, so that no damage is done to the blade, chassis or axle. The autoplows can be operated at a speed of four miles an hour on an average."

No. 5 and No. 6 scoop shovels have proven the best all-around shovels for snow work.

NO DRAINAGE PROVIDED. CROSSWALK FILLED WITH WATER.

Road scrapers and motor plows, as well as wide snow shovels, can be used for removing the snow for a distance of five or six feet from the cross walks. It is also deemed advisable to make use of the two gutter plows that are owned by the city for cleaning out gutters outside the panning area while the snow is still soft.

Cleaning snow from cross walks and opening gutters and laterals for drainage needs special attention. Ice and compacted snow has been allowed to pile up on certain streets until early spring and when the thaw comes is removed by picks and chisels. Ice is often found 20 to 30 inches thick on certain streets where only a small part of the snowfall is removed during the winter. The labor cost of this, including picking up, loading, hauling and dumping, is approximately 7 cents per square yard with ice from one to six inches thick.

The ruts made by motor vehicles through compacted snow and ice on asphalt streets are not only a cause of danger, annoyance and expense to the motor owners, but are becoming a real menace to the life of the asphalt pavement where the chained wheels continually cut through the snow in long ruts and damage the pavement surface. It is believed that plowing will help to solve this ice rut problem.

In a number of the streets in the residential districts, sidewalk plowing is practiced regularly. It is done by contract and paid for at the arbitrary rate of two cents per lineal foot per season. Investigation seemed to show that the contractor would make a profit during even the most severe winter if paid at the rate of 1.2 cents per lineal foot per season. A fair average over a period of years for the city of Rochester seems to be 35 plowings of each sidewalk a season. During the season of 1915-16 the average number of trips made was 55. The actual cost of such sidewalk cleaning in Winnetka, Ill., during the same year was 65.8 cents per mile-trip on a basis of 80 cents per hour per team.

PAVEMENT CONSTRUCTION POLICY DESIRABLE.

The American Association of State Highway Officials has presented to the Government, through the Director-General of Railways, resolutions urging the formulation of a definite policy concerning road and street construction next spring, and assurance that there will be no freight car embargo against the hauling of material necessary for the construction decided upon. We do not need to assure readers of Municipal Journal that these resolutions have our hearty support. The resolutions are as follows:

WHEREAS, the proper construction and maintenance of the highways of the country is necessary to the successful conduct of the war; and,

WHEREAS, the plans of all highway authorities in the country, all users of highways, and all citizens interested in any way in highway construction and maintenance, are at the present time upset and tied up; and, WHEREAS, here is need for a definite policy so that plans can be formulated for the coming year; and,

WHEREAS, a properly outlined policy directing the construction and maintenance of such roads and streets as are of general economic and military value will conserve the resources of the country and will greatly facilitate the transportation of freight over highways and streets,

THEREFORE BE IT RESOLVED that the American Association of State Highway Officials request the United States Government to formulate and promulgate, as soon as possible, a definite policy for road and street construction and maintenance, and

That it is requested that said policy contain a statement that freight cars shall be furnished next spring for the transportation of the necessary materials for the construction and maintenance of streets and roads of economic or military value.

There might be added to this a request that Secretary McAdoo approve of the raising of funds for carrying out the road program, inasmuch as it has been suggested that the issuing of state highway bonds might interfere with the sale of Liberty Bonds. As Secretary McAdoo is both secretary of the treasury and director general of railroads, he should favor highway work to relieve the freight congestion which is now his most difficult problem.

MOTOR TRUCKS AND HIGHWAY TRANSPORTATION

Analysis of Extent to Which Trucking Freight Might Relieve Railroads—Adapting Roads to This Service—Some Figures from Practice.

By MAURICE B. GREENOUGH.[†]

The latest report of the Bureau of Railway Economics for the Railroads' War Board contains figures that show, among other things, that on August 1st, 1917, there was a shortage of 34,000 freight cars as compared with a surplus of 265,000 cars on August 1st, 1915; this in spite of the fact that both cars and engines are making considerably more ton-miles per day than ever before. The best that railroad officials hope to do (the Government had not taken over the railroads when this was written) is to add enough new locomotives and freight cars to replace those that must be scrapped during the coming year. The "Railway Age Gazette" says, "All the evidence indicates that *under existing conditions* the railways are approaching the limit of what is *practicable* for them to do."

On November 15th the Railroad's War Board issued a bulletin, one of 14 suggestions therein for expediting transportation and relieving shortage being: "Encourage the use of motor trucks and trolley lines for handling short-haul freight." To assist in relieving the condition described, the American people should make it a guiding principle to ship nothing by railway that can possibly be sent over the highway. Approximately 50 per cent of present freight traffic is now directly connected with war maintenance and within the coming year it is expected that this amount will rise to 75 per cent. W. A. Alsdorf, secretary of the Ohio Good Roads Federation, recently said: "If the war is not won in 6 months, virtually every private shipper will be *forced* to send his freight over the highway."

Let the Cleveland-Akron highway in Ohio serve as an example of short-haul relief. In a recent 72-hour traffic survey, 504 trucks were observed in 32 hours. Twenty-eight different commodities were recorded, aggregating 890 tons. If freight cars had been used, 32 would have been required. But relief was afforded equivalent to despatching one car an hour alternately from Cleveland to Akron and from Akron to Cleveland. This traffic also was entirely spontaneous; it was entirely without any encouragement to make use of the advantage other than the potential opportunity.

A motor truck traffic of 16 vehicles an hour is far below the capacity of a substantial highway. If the traffic were to be at the rate of one vehicle a minute, there can be transported between 6 A. M. and 10 P. M. 7,200 tons of freight between Akron and Cleveland.

For every 30 days there is then relief at the rate of 315 trainloads, the equivalent of 5 trains a day each way.

To build an enduring commercial highway between two cities 50 miles apart requires the loan of 5,000 single freight car trips if all the materials for the road are imported. (This assumes a monolithic brick highway, 18 feet wide, 4-inch brick laid on 4-inch concrete, without curbing.) After the road is built, the original loan of cars is repaid in relief in 35 days, and for every 30 days thereafter on the truck a minute basis, the same 315 trainloads can be shipped. Reproduce these illustrations in general application throughout the country and transportation shortage is a thing of the past.

The commercial use of highways forces a readjustment in our views of traffic itself. Counting and classifying traffic means little in itself. The weight of vehicles becomes paramount. Heretofore, practical recognition of vehicular weights has come from legislative rather than from scientific bodies. Nearly all laws restricting weights, however, have had the effect of denying the use of highways to a character of service that the present transportation predicament of the country renders essential to be encouraged. The basis of this legislative restriction seems to be that type of road improvements which is cut into and rutted by heavy traffic—traffic that represents a practical carrying unit.

Those types which are structurally incapable of becoming rutted or broken up are placed in the same class by the law. The situation is exactly analogous to what would obtain if railroad engine and car weights were to be restricted to the load bearing capacity of rails 60 pounds to the yard laid in a cinder ballast, when there are thousands of miles of railroad line built of 120 pound rails, rock ballasted, that are particularly intended for the heaviest rolling stock.

Railroad engineers, by practice, have demonstrated that they have a clearer grasp of what is meant by building a road to meet the traffic than have highway engineers. They know the economy of hauling in the larger units and so they correspondingly increase the strength of their road beds and bridges to accommodate more economical hauling.

Under the new conception, a highway represents a potential transportation asset belonging to the public. There should then be a concerted move on the part of the public and its officials to encourage the use of the road up to the limit of its capacity. In other words, we must "dig up the business for our roads" and adjust our viewpoint of their functions to this attitude. Our highways will then be classified as 1-ton roads, 3-ton roads or 5-ton roads, and a uniform system of regulation adopted which encourages, not discourages, use.

At the outset of applying this program, there are thousands of roads whose capacity of commercial transportation is limited by the particular unfitness of a few miles, either unimproved or once improved and allowed to deteriorate. Bringing these roads into serviceable condition suggests itself as the first step.

Many roads are adequately surfaced, but bridges and culverts are weak or defective. The experience of the Goodyear Company of Akron, Ohio, in projecting their

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[*] Abstract of paper presented before Section D of the American Association for the Advancement of Science.

[†] Chief Engineer, National Paving Brick Manufacturers' Association.

truck line from Akron to Boston illustrates this handicap. Because of weak bridges this company was unable to make use of the most desirable route—that through Cleveland, Buffalo and Albany—in spite of the fact that the distance is less, the grades easier and the general character of the road surface superior. Consequently they were forced to choose a road having 20 miles of unimproved clay and three mountain ranges to cross, through which an average speed of only 6 miles an hour has been possible. The construction of new bridges and culverts and strengthening those that are weak has been a frequent subject of discussion, but this is now a time for action rather than prolonged argument.

The great need for usable highways suggests an orderly progress in improvement in 1918, first connecting the gaps in improved roads, second proceeding to the improvement of main highways between important centers for commercial transportation, and third, extending as rapidly as possible road improvements in farming country as an aid to the marketing of crops, and without which increased farm production is virtually prohibited.

The substitution of legislative encouragement for restriction and the creation of endeavors to secure a wider use of highways are essential.

The experience of the Goodyear Tire and Rubber Company previously cited shows that the cost of motor truck hauling to them has been less than the cost of express shipping. The saving in time over express and freight transportation has more than repaid the effort. The public generally will be in a position to take advantage of highway shipping, once it appreciates the gravity of the situation which calls for relief, and the asset to be found in its highways.

NEW YORK FIRE ALARM TELEGRAPH

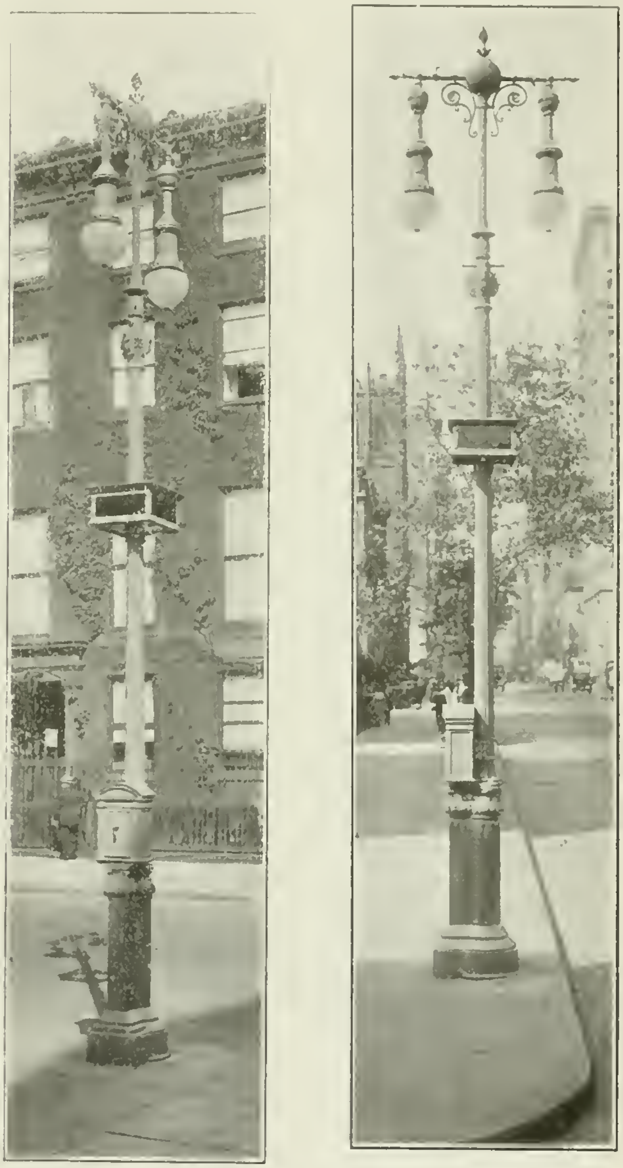
System Just Finished in Manhattan Borough—One of the Most Complete in the World—Cables Underground—Boxes Carefully Located.

The work done during the year of 1917 upon the reconstruction of the fire alarm system of New York City is the subject of a report made a few days ago to Fire Commissioner Robt. Adamson by chief electrical engineer Putnam A. Bates. In this he reviews the undertaking from its beginning, in view of the fact that the present administration has just gone out of office and that the system in the borough of Manhattan is practically completed. The total sum authorized for all boroughs has amounted to $2,879,276, nearly 80 per cent of which has either been expended or is required to meet payments on contracts in process of completion; while practically all of the remainder will be required by contracts that are now awaiting authorization by the Board of Estimate and Apportionment.

The new fire alarm system on the island of Manhattan has practically been completed, including the central station equipment. Also the underground construction of a portion of the new system in Brooklyn and Bronx boroughs has been completed. Plans for these boroughs have been prepared in all details and are ready for consideration by the administration which has just been inaugurated. In addition, the underground cable system with its full complement of street box posts has been installed in a part of the borough of Queens.

The type of fire alarm street box known as the "Twin Post" (which was described in the issue of Municipal Journal of February 15, 1917) is considered to meet the conditions imposed most admirably. While it gives an independent casing for protecting the fire alarm cables and box mechanism, it is so designed and attached to the street lighting post as to give the two the appearance of one structure and takes up very little additional sidewalk space. The nature of the manufacture and placing of these posts was such that the work could not be hurried and all of them have not yet been manufactured and set. As a result, the complete fire alarm system for the borough is not ready for operation.

Mr. Bates calls especial attention to the desirability of hastening the reconstruction of the fire alarm systems in the other boroughs, emphasizing the trouble and danger caused by the existence of the large number of circuit conductors which exist in the form of open wiring strung on poles. Practically every time a severe storm occurs, these circuits "open" at some point, which interrupts the continuity of the conductors and makes the alarm system inoperative.



TWO VIEWS OF "TWIN POST" FIRE ALARM BOX.

In addition to the interruption of service caused by damage to the overhead wires by wind and sleet storms, these wires frequently fall on trolley wires and other conductors carrying high-voltage currents, thereby introducing this high voltage into the fire alarm circuits, damaging the equipment and rendering the circuits inoperative. Where overhead wires pass a burning building it frequently happens that the conflagration so damages them that they become inoperative.

The new system in Manhattan is one of the most complete in the world and is a great improvement over the one that it will replace. Instead of the 816 boxes of the old system there will be 1,651 boxes in the new system, and not more than 10 boxes on any one circuit, there being four times as many circuits in the new system as in the old. The circuits are so arranged as to avoid the possibility of any general breakdown, which has been the chief peril of the old system.

In placing the new cable system use has been made of subways constructed for this purpose by the Subway Co. without cost to the city, under the terms of the franchise granted to it for the use of the city streets, the estimated cost of these subways being $1,600,000.

The new fire alarm headquarters are located in Central Park and will be opened as soon as the installation of boxes has been completed.

In the new system for Brooklyn, the underground cables will be placed in conduits supplied by the New York Telephone Co. As in the Manhattan equipment, only 10 boxes will be attached to any single box circuit. Each fire house will be connected with the central office by circuits wholly independent of the alarm box circuits, the maximum number of fire houses connected on any one circuit being four. Alarms of fire will be sent to the new central office headquarters from the street boxes and will then be transmitted to the fire houses over the central office circuits. Provision is included, by means of independent circuits, for notifying independently the chief of the department, his under-chiefs, fire-boat stations and the insurance patrols, so that they will receive all alarms of fire at all hours. Public schools and other public buildings also are to be connected to the street-box system, each such building having assigned to it one box.

Each alarm box location in the city has been chosen as a result of the combined judgment of the chief of the department, his deputy chiefs and battalion chiefs, and in consultation with the fire risk experts of the New York Board of Fire Underwriters.

The New York Fire Insurance Exchange has offered to make substantial reductions in the insurance rates, which are estimated to be more than equal to the interest charges on the cost of construction of the new fire alarm system.

ROAD AND BRIDGE BUILDERS WANTED.

To Pave the Way for the Triumphal Entry of the United States Army Into Berlin.

The Chief of Engineers of the United States Army, Major General W. M. Black, has asked the cooperation of this paper and of its readers in securing, for immediate service in France, road and bridge builders, woodsmen and lumbermen to enlist in the Twentieth Engineers, the largest regiment in the world, known as the Lumbermen's regiment. This regiment consists of 7,500 men divided into ten battalions and thirty companies. The urgency of the need for the skilled men that will compose this regiment is indicated by the request that those who wish to enlist wire to the War Department at Washington.

Most interesting to most of our readers, probably, is the call for enlistment in road and bridge building units. There will be three auxiliary unit battalions of highway construction men, known as the 41st, 42nd and 43rd Auxiliary Forestry Battalions. Three thousand men are wanted for these at once. These will consist of men skilled in Road Building—Bridge Building—Operating Rock Crushers—Operating Road Rollers—Driving Motor Trucks—Ordinary Road Laborers.

The pay when abroad is as follows: **Battalion**: Master engineer, senior grade, $96; master engineer, junior grade, $84; battalion sergeant major and battalion supply sergeant, each $60; sergeant, $51.20; corporal, $40.80; wagoner, $40.20; cook, $44; privates, first class, $36.60; privates, $33. **Company**: First sergeant, $60; sergeant, first class, $60; supply sergeant, mess sergeant, stable sergeant, and sergeant, each $51.20; corporal, $40.80; horseshoer, $44; saddler, $40.20; wagoner, $40.20; cook, $44; bugler, $33; private, first class, $36.60; private, $33. All of the commissioned officers have already been selected.

Able-bodied white men, citizens of the United States, not subject to draft (18 to 21 and 31 to 40), can enlist at any recruiting station. Those subject to draft can be inducted into the 20th Engineers under the Selective Service Law, provided their number is so low that they do not come within the current quota of their local board.

Those who consider themselves qualified and desire to enlist in the road and bridge building units should wire or write Major H. L. Bowlby, Room 25, War Department, Washington, D. C., advising their age, full name and address, number of years experience in road or bridge building work, and class of work they are best qualified to perform. If the applicant properly qualifies, the necessary papers for induction into the service will then be mailed to him.

HIGHWAY WORK IN FRANCE.

A large and most important part of the work to be done by American engineers in France will be the maintenance, and in some cases, probably, the construction, of highways immediately behind the firing line, including the bridges on such highways. It is stated that 1.200 miles of highways must be maintained by our engineers, German prisoners being used to a considerable extent as laborers.

An idea of what the road experts may be called upon to do may be ganied from the work performed by the Allies in the big drive upon Verdun. This is described by "The Tech" as follows:

> "Approximately one million men were moved to the front by the Allies after the drive began. All of these men were moved in motor trucks over one road fifty miles in length.
>
> "In nine days nine hundred thousand men, to say nothing of the hundreds of thousands of tons of food and munitions, were moved over this one stretch of highway. Seventy-five thousand men worked constantly day and night to keep the surface of the road in condition. Frequently bursting shells tore great holes in the highway, but the road builders repaired the damage so quickly that there was hardly a pause of the overflowing tide of motor trucks.
>
> "A tremendous task faces the regiment, for the roads must be of the very best. New means must be devised if the roads are to stand up under the traffic, for reports received from official British and French sources declare that wear and tear are ten times as great as on Fifth Avenue, New York. Cement cannot be used, because it requires too much time to harden. The roads probably will be built of a type of macadam. It is estimated that the regiment will use five hundred tons of crushed stone every twenty-four hours. The roads will be coated with tar, which, fortunately, is easy to obtain in France in large quantities. Eighty per cent of the work will be maintenance; twenty per cent the construction of new roads."

The equipment and methods to be used by the American engineers will both differ from that familiar to the European engineers, and it will be up to the former to prove the superiority of American machinery and methods. The equipment will include rollers, graders, traction engines, motor trucks, steam shovels, stone crushers, scarifiers, automobile trucks and trailers, portable machine and blacksmith shops, pile drivers, concrete mixers, air compressors, drills, industrial railway equipment and wheel-scrapers. Most of this is already in France awaiting the arrival of the engineering regiments.

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Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

EARLY ANNUAL REPORTS.

For several years past we have welcomed as the first annual city engineer's report to reach us that of Frederick R. Charles, city engineer of Richmond, Ind. Again this year the Richmond report is the first for the year of 1917 to reach our office. It was followed, however, a few days later by that of T. Keith Legare, city engineer of Columbia, S. C. It is, of course, not to be expected that a report for the year of 1917 could be printed and distributed within a week of the end of the year. The Richmond report is written on tracing cloth and blue printed, while that of Columbia is typewritten. The fact that such officials can complete the report itself within a few days of the conclusion of the year, however, indicates the possibilities in this direction if notes and records are kept up to date and in a form easily summarized; and with the cooperation which should be obtainable from local printing establishments and that which the counsel should grant cheerfully, it would seem to be possible to have printed public reports ready for distribution within two months after the closing of the fiscal year.

During the same first week of January we received a printed report of one of the larger cities for the year 1916, just twelve months after the ending of the fiscal year. There are a number of interesting matters in this report, and it is possible that we may find some which we think of sufficient permanent interest to municipal officials to be given space in Municipal Journal; but the greater part of it is so far out of date that it has lost practically all of its interest, except for the citizens immediately concerned. We realize that where the reports of five or ten different departments are to be combined in one volume, one dilatory official may hold up the entire report. In this connection we call attention to the procedure followed in Columbus, Ohio, as described in out issue of November 22, where the head of each department has it impressed upon him that the getting of his report into the hands of the Bureau of Publicity not later than a fixed time following the termination of the fiscal year is as important a part of his duties as almost any other function of his office.

On account of this difficulty of getting all reports in on time, as well as for other reasons (among them being the possibility of calling special attention of persons or organizations interested in certain departments to the reports of such departments), there is considerable advantage in a separate publication and binding of the reports of the several departments. This, of course, applies only to large cities where the report of each department would occupy a pamphlet of some size. This plan was adopted some years ago by the Massachusetts State Board of Health with respect to its annual reports, and is followed by a few of the larger cities. While the cost of binding would be greater, not so many copies of each report would be needed, since, in many cases, separate reports and not the entire set would be sent. A saving of postage also would be effected.

WAR ROADS, HERE AND ABROAD.

As stated elsewhere in this issue, the War Department is asking for three thousand experienced road and bridge builders for immediate service in France, presumably for the purpose of building and maintaining the roads over which war munitions are to be transported from the sea ports to the American forces in cantonments and trenches. The urgent request made by the department for cooperation in obtaining these men is an indication of the vital necessity of these roads to our prosecution of the war. We already have sent locomotives and cars by the thousand, and experienced railroad builders and operators, but this does not eliminate the necessity of using motor trucks by the tens of thousands and providing the roads to carry them.

"From Detroit to Berlin" was the sign on one of the Army trucks that recently made the trip from the factory to their port of embarkation. And a mighty suggestive sign it was. Not only army trucks but munitions as well must flow in continuous streams from farms and factories here to the front over there. The army recognizes that at its end the road is as important a medium of transportation as the railroad, the motor truck as the locomotive. Equally as true is it at this end. Road building is a war necessity in France; it is no less a war necessity in the United States. The roads there and the roads here are both parts of the same route, merely interrupted by the Atlantic ferry. They are both links in the same chain. Neglect of any transportation facilities here will be as fatal to getting munitions to our army as similar neglect in France.

We do not see how any one can advocate the cessation of road construction in this country. Roads, more roads and better roads are a war necessity. Some roads are more necessary than others; but direct aid to the war can be given this year by pavement construction and improvement in even greater volume than in previous years. Money spent wisely in road construction is as helpful as if invested in Liberty bonds.

As we go to press we receive from the Executive Committee of the American Association of State Highway Officials a copy of resolutions adopted by that association requesting the Government to promulgate a definite policy for road and street construction and maintenance, and give assurance that cars will be furnished for the transportation of materials necessary therefor. These will be found on another page.

RICHMOND'S ANNUAL REPORT.

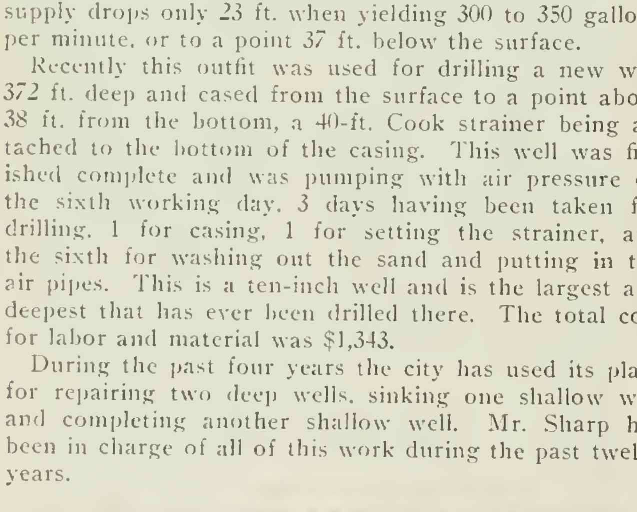
The annual report of the city engineer of Richmond, Ind., Fred R. Charles, for the year ending December 31, 1917, is the last report of this official, as his term of office expired with the end of the year. Mr. Charles has held the office for 13 years, during which time the city has spent nearly $1,300,000, an average of nearly $100,000 a year. Owing to the war, the amount done last year was considerably less than this, or a little under $40,000. Among the interesting work done by the engineer may be mentioned the subdivision of park fields into about thirty municipal gardens, which were distributed to citizens and cultivated by them, and also the assisting of the civic gardener and other individuals in locating a great number of war gardens on vacant lots, by the use of which a considerable addition was made to the food supply of the community. As in previous reports, the standard units recommended by the American Society of Municipal Improvements are used.

WELL DRILLING BY CANTON WATER DEPARTMENT.

The superintendent of the Canton, Miss., electric light and water works, J. T. Sharp, Jr., furnishes the following information, with accompanying photograph, describing work done recently in drilling a new well for the water supply. The water works is owned and operated by the city under a commission, being now in its 13th year. A complete well-drilling outfit forms a part of its equipment, by which the city is able to drill deep wells and do any well repairing that is necessary. Two sources of supply are available to the city, one at 1,020 ft. deep which will rise 12 ft. above the surface, and another at a depth of 375 ft. which will rise to a level of 14 ft. below the surface. A well tapping the latter supply drops only 23 ft. when yielding 300 to 350 gallons per minute, or to a point 37 ft. below the surface.

Recently this outfit was used for drilling a new well 372 ft. deep and cased from the surface to a point about 38 ft. from the bottom, a 40-ft. Cook strainer being attached to the bottom of the casing. This well was finished complete and was pumping with air pressure on the sixth working day, 3 days having been taken for drilling, 1 for casing, 1 for setting the strainer, and the sixth for washing out the sand and putting in the air pipes. This is a ten-inch well and is the largest and deepest that has ever been drilled there. The total cost for labor and material was $1,343.

During the past four years the city has used its plant for repairing two deep wells, sinking one shallow well and completing another shallow well. Mr. Sharp has been in charge of all of this work during the past twelve years.



WELL DRILLED BY CANTON WATER DEPARTMENT.

AUXILIARY FIRE EQUIPMENT (Continued).

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extin-guish-ers	Solid Tires	Pneu-matic Tires	Feet of Hose	Type of Alarm System
Detroit	..	..	..	8	..	..	2,000	Whistle
Duluth	1	1	..	28	..	..	20,800	Gamewell
E. Grand Forks	..	..	..	..	..	..	3,800	Phone
Fairmount	1	..	1	12	..	..	2,500	Phone
Hastings	1	..	1	8	..	..	2,500	Bell
Little Falls	1	..	..	..	..	..	4,500	Whistle and Bell
Minneapolis	3	2	2	24	..	..	72,000	Gamewell
New Ulm	1	..	7	8	..	..	3,000	Gamewell
Pipestone	1	..	..	5	..	..	1,500	Phone
St. Cloud	..	..	..	..	..	..	3,900	Gamewell
St. Paul	2	..	8	..	..	10	55,000	Gamewell
Stillwater	..	1	..	[illegible]	..	..	5,500	Electric
Thief River Falls	..	..	1	5	..	..	2,300	Siren
Two Harbors	..	..	..	..	..	..	2,900	Phone and Whistle
Virginia	1	..	1	14	1	2	7,500	Gamewell
Willmar	1	..	1	..	..	..	2,000	Phone
Winona	1	..	12	..	..	..	8,000	Gamewell
Mississippi:								
Jackson	1	2	..	10	..	..	7,600	Gamewell
Vicksburg	1	..	2	10	8	5	6,000	Gamewell
Missouri:								
Cameron	..	..	1	2	4	4	1,400	....
Carthage	..	3	..	6	..	4	2,500	Phone
Chillicothe	2	..	2	4	..	..	2,500	Phone
Hannibal	..	2	2	8	..	..	5,000	Phone
Kansas City	1	2	..	96	..	16	42,000	Phone
Maryville	..	..	4	4	..	..	2,000	Phone
Moberly	..	..	1	5	..	..	2,700	Phone

AUXILIARY FIRE EQUIPMENT (Continued).

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extin-guish-ers	Solid Tires	Pneu-matic Tires	Feet of Hose	Type of Alarm System
Silver Creek	..	..	..	8	..	10	2,200	Phone
Solvay	..	..	3	8	..	..	6,000	Gamewell
Syracuse	..	2	..	44	..	..	35,000	Gamewell
Tonawanda	..	..	6	5	..	..	5,500	Gamewell
Utica	..	..	11	32	..	..	14,600	Gamewell
Warsaw	..	..	..	8	..	..	2,700	Stevens
Watkins	1	..	..	2	..	..	3,000	Star
Waverly	..	..	1	6	..	..	3,200	Gamewell
Westfield	..	..	..	8	..	2	2,700	Bell, Phone and Whistle
White Plains	1	..	2	18	..	..	6,000	Gamewell
Whitesboro	..	..	..	2	..	..	1,500	....
Yonkers	..	..	3	26	..	..	17,000	Gamewell
North Carolina:								
Asheville	1	..	6	25	16	12	8,500	Gamewell
Durham	..	..	..	8	..	..	6,000	Gamewell
Kinston	..	..	1	1	..	..	3,500	Gamewell
Mooresville	..	..	1	4	..	2	2,000	Phone
Raleigh	1	3	4	10	12	14	7,000	Gamewell
North Dakota:								
Carrington	..	..	..	6	..	..	1,200	Bell and Whistle
Jamestown	1	..	1	6	..	..	2,100	Siren and Bell
Valley City	1	1	2	10	..	..	3,000	Whistle
Williston	..	..	1	..	..	..	1,600	Phone
Ohio:								
Akron	1	..	5	35	..	2	15,700	Electric
Alliance	..	2	2	10	..	..	5,000	Gamewell

Monett	..	..	..	..	..	..	1,000	Phone
Poplar Bluffs	..	..	..	..	..	..	1,800	Phone
St. Charles	..	..	1	4	..	..	3,500	Gamewell
St. Louis	2	2	2	75	·23	18	100,000	Gamewell
Springfield	..	1	1	16	..	8	11,200	Gamewell
Washington	..	..	..	6	.	..	2,000	Phone
Webster Groves	..	..	..	5		..	4,000	Phone
Nebraska:								
Nebraska City	..	..	1	7	2	2	3,000	Whistle and Phone
Norfolk	1	1	2	7	.	..	3,200	Whistle and Phone
Nevada:								
Reno	..	..	5	10	..	..	5,500	Gamewell
New Hampshire:								
Concord	..	..	1	25	8	16	17,000	Gamewell
Laconia	1	..	2	23	6	..	12,000	Gamewell
Nashua	1	..	..	21	.	3	11,000	Gamewell
New Jersey:								
Flemington	..	..	..	10	..	..	2,000	....
Freehold	..	..	..	11	8	10	2,000	Bell
Glen Ridge	..	..	3[4]	8	..	.	3,500	Gamewell
Hackensack	..	1	1	12	12	14	6,500	Star
Haddonfield	1	..	1	4	4	.	1,800	Phone
Hammonton	..	..	..	6	4	4	2,300	Bells
Irvington	..	..	..	6	..	.	3,500	Gamewell
Jersey City	2	4	1	2	..	..	42,000	Gamewell
Kenworthy	..	..	..	2	.	..	750	Bell
Lambertville	1	..	4	25		.	3,000	Whistle
Millville	..	..	6	12	..	..	3,000	Gamewell
Pitman	..	..	1	15	..	..	2,700	....
Plainfield	1	1	5	12	21	10	7,000	Gamewell
Roosevelt	..	..	1	2	1	..	2,000	Whistle
Woodstown	..	..	..	..	..	..	1,500	Bell and Whistle
New Mexico:								
Raton	..	..	2	1	1	.	2,100	Phone
Roswell	..	..	..			.	4,000	Phone
New York:								
Albany	1	5	5	50	..	..	27,000	Star
Amityville	..	..	1	4	4	4	3,000	Phone
Auburn	1	1	1	13	.	2	9,400	Gamewell
Batavia	..	..	..	16	1	..	5,000	Gamewell
Binghamton	..	..	..	32	.	..	19,100	Gamewell
Brockport	..	..	3	10	12	1	3,900	Sterling Siren
Buffalo	3	10	1	2[6]	..	..	115,000	Gamewell
Canastota	..	2	1	6	1	.	2,500	Bell
Cohoes	1	1	2	12	2	2	9,000	Gamewell
Corning	..	..	2	10	..	..	5,000	Gamewell
Elmira Heights	..	..	1	2	..	..	2,100	....
Frankfort	..	..	1	4	..	..	2,300	Gamewell
Freeport	..	..	2	12	.		4,000	Phone
Fulton	..	..	1	10	.		5,200	Gamewell
Geneva	1	..	3	10	16		6,000	Gamewell
Gloversville	1	..	1	6		.	6,000	Gamewell
Goshen	1	.	3	8			4,000	Gamewell
Herkimer	..	..	1	8		.	6,000	Gamewell
Jamestown	1	1	16	25			1,000	Gamewell
Johnson City	1	1	2	6			3,000	Gamewell
Liberty	..	..	..	6	.	2	3,000	Phone
Little Falls	.	..	2	12			6,000	Gamewell
Lowville	..	..	..	8	..		3,550	....
Mamaroneck	1	..	3	10	12	..	5,000	Gamewell
Mechanicsville	..	..	3	9	1	1	4,500	Gamewell
Middletown	2	..	3	18	5	1	11,000	Gamewell
New Rochelle	..	2	9	34	9	2	7,500	Gamewell
New York	6	12	1[5]	..	..	.	600,000	Gamewell
Oswego	..	..	4	10	..	.	5,000	Gamewell
Patchogue	..	..	3	6		1	3,200	Gamewell
Peekskill	1	1	3	14		..	5,000	Gamewell
Plattsburgh	..	..	..	..	.	.	4,500	Gamewell
Rome	..	3	1	12		1	10,000	Gamewell
Rye	..	..	6	10	12	..	4,000	Gamewell
Scotia	2	2	1	10	..	..	2,400	....
Ashland	..	..	2	6	..	..	2,500	Bell
Bellaire	1	..	4	..	..	..	5,000	Gamewell
Bellefontaine	1	..	1	4	4	..	4,000	Gamewell
Bryan	..	2	1	8	..	..	3,250	Phone
Bucyrus	.	1	..	8	..	..	3,800	Gamewell
Carrollton	..	..	..	5	.	..	1,600	Bell
Cleveland	3	2	2	75	..	..	68,000	Gamewell
Columbus	1	..	..	.	..	..	40,000	Gamewell
Conneaut	..	..	..	..	..	..	4,000	Gamewell
Crestline	..	3	1	5	..	..	1,700	Phone
Dennison	..	..	..	..	..	..	3,500	Bell
E. Cleveland	..	5	5	6	18	6	4,000	Phone
Elyria	1	1	1	19	14	4	5,300	....
E. Palestine	1	..	..	4	..	..	3,000	Whistle
Findlay	..	1	1	6	..	..	7,500	Gamewell
Greenfield	..	..	..	1	..	..	2,500	....
Jackson	..	..	2	6	4	..	2,500	Bell
Jefferson	..	..	..	2	..	..	1,000	Bell
Kenton	1	2	2	6	3	..	3,500	Gamewell
Lakewood	1	2	2	8	6	10	3,500	Gamewell
Lebanon	..	..	2	2	..	..	2,500	Phone
Lima	1	..	..	16	..	..	9,000	Gamewell
Lorain	1	..	3	30	..	..	14,000	Phone
Marietta	1	1	..	8	4	4	4,800	Gamewell
Martin's Ferry	.	..	3	12	..	..	4,500	Gamewell
Middletown	.	..	..	..	..	..	4,500	Gamewell
Mt. Vernon	.	..	..	6	..	..	3,500	Phone
New Philadelphia	..	1	1	4	..	..	4,000	American
Oberlin	..	.	..	..	..	..	2,300	Phone
Orrville	.	..	1	8	.	4	1,400	Bell and Whistle
Portsmouth	2	1	5	22	3	5	15,000	Gamewell
Salem	..	..	..	.	..	..	4,000	Phone
Springfield	2	10	4	20	1	10	13,000	Gamewell
Toledo	.	..	12	38	207	14	34,000	Gamewell
Warren	.	..	..	..	..	..	5,100	Gamewell
Weston	..	..	..	1	..	..	1,800	Bell
Youngstown	1	2	1	27	19	5	1,800	Gamewell
Oklahoma:								
Ada	..	..	2	4	1	1	4,000	Whistle and Phone
Bartlesville	1	1	2	4	.	1	4,500	Gamewell
Chickasha	1	2	1	9	..	..	5,000	Phone
Hugo	..	.	..	6	..	..	3,000	Phone
Miami	..	..	.	3	..	..	1,750	Phone
Sapulpa	1	.	1	12	..	..	8,000	Gamewell
Oregon:								
Astoria	1	3	..	17	..	..	8,000	Gamewell
Baker	.	..	..	4	..	..	6,250	Phone
Corvallis	1	..	5	8	6	..	4,550	Phone
Marshfield		2	2	10	6	2	5,000	Siren
Roseburg		..	1	8	4	5	3,500	Phone
Pennsylvania:								
Altoona	1	2	.	22	4	4	18,100	Gamewell
Bangor	..	..	.	8	1	..	5,750	Gamewell
Beaver	1	.	..	2		.	2,400	Siren
Beaver Falls	1	1	2	7	1	1	5,500	Gamewell
Bellwood	..	..	.	6	.	..	2,600	Whistle
Blairsville			2	4		5	3,000	Bell and Phone
Bristol	1		4		..	..	5,000	Gamewell
Brookville	.	.	.	5	.	..	1,800	Gamewell
Carlisle	.	1	1	13		.	7,000	Gamewell
Clearfield	.		2	.	1	.	6,000	Gamewell
Connellsville	1	1	3	12		..	4,500	Gamewell
Duquesne	.	1	3	3	6	..	2,200	Star
Duryea	..		1	2		..	2,000	Phone
Easton	1	.	.	20	.	7	15,000	Gamewell
Franklin	.	1	2	..	4	..	150	Gamewell
Galeton	.	..	.	5		5	2,400	Phone
Gallitzin	.	.	1	6		..	1,000	Bell
Girardville	..	.	.	3	.	10	2,000	....
Jeannette	.	.	1	8	1	..	2,000	Gamewell
Jersey Shore	.	..	1	4		2	2,200	Electric[7]
Lansford	.	.	3	4	..	..	2,000	Gamewell
Latrobe	..	..	20	12		..	3,300	Siren
Lehighton	..	..	..	5	..	..	2,000	....
Mt. Union	..	..	..	3	..	..	2,000	Whistle

AUXILIARY FIRE EQUIPMENT (Continued).

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extinguishers	Solid Tires	Pneumatic Tires	Feet of Hose	Type of Alarm System
Pennsylvania:								
Norristown	2	..	..	12	..	..	10,000	Gamewell
Oil City	1	..	..	3	..	6	7,400	Gamewell
Philadelphia	..	..	38	86	..	..	....	Gamewell
Pittsburgh	..	1	torches on all trucks	164	..	..	167,000	Gamewell
Plymouth	..	..	3	6	..	..	3,000	Gamewell
Pottstown	..	..	1	6	..	..	4,500	Gamewell
Quakertown	..	..	1	4	4	..	2,600	Store House
Reading	1	..	2	28	..	..	.....	Gamewell
Scottdale	..	..	14	10	..	17	4,800	Whistle
South Fork	..	..	..	6	..	..	1,000	Gamewell
Sunbury	..	..	..	12	..	..	8,000	Gamewell
Turtle Creek	..	..	3	7	4	..	3,000	Bell
Tyrone	..	..	..	12	..	..	3,500	Whistle
Uniontown	..	2	2	8	8	..	4,500	Gamewell
Warren	1	2	..	8	1	..	5,700	Gamewell
West Berwick	..	..	2	2	..	..	2,500	Whistle
West Chester	1	3	3	10	..	..	4,500	Electric[7]
Wilmerding	..	..	2	3	..	..	3,000	....
Rhode Island:								
Central Falls	..	..	..	15	..	..	.....	Gamewell
Woonsocket	..	1	3	18	4	20	15,500	Gamewell
South Carolina:								
Aiken	..	..	..	..	..	..	3,000	Gamewell
Charleston	..	4	..	30	..	..	16,000	Gamewell
Darlington	..	..	1	6	..	..	3,000	Gamewell
South Dakota:								
Aberdeen	1	1	1	10	7	10	4,500	Phone
Lead	..	2	1	18	10	..	10,000	Gamewell
Madison	1	..	..	12	..	..	1,500	Bell
Watertown	1	1	1	6	6	..	3,000	Phone
Tennessee:								
Chattanooga	..	1	2	20	..	..	16,000	Gamewell
Clarksville	..	..	1	6	2	..	3,500	Phone
Cleveland	..	..	1	2	..	1	2,000	Gamewell
Greenville	..	..	1	4	..	..	1,500	Siren
Humboldt	..	..	..	..	..	..	800	Whistle
Jackson	..	..	1	4	1	..	4,700	Phone
Johnson City	..	..	1	2	1	..	2,100	Phone and Whistle
Knoxville	..	..	1	40	..	..	22,000	Gamewell
Nashville	..	..	..	32	2	2	23,600	Gamewell
Paris	..	..	1	2	..	..	1,500	Whistle
Texas:								
Amarillo	..	..	..	5	10	12	3,200	....
Austin	..	..	..	20	21	15	15,000	Phone
Bonham	..	..	1	6	..	..	2,200	Phone
Brenham	..	..	..	4	..	6	1,600	Phone
Dallas	..	2	6	70	9	5	40,000	Gamewell
Denison	..	1	2	8	12	6	4,500	Phone
El Paso	..	1	4	22	14	8	16,000	Gamewell
Gainesville	..	..	1	6	..	..	3,000	Phone
Georgetown	..	..	..	..	..	..	3,000	Electric
Houston Heights	..	..	3	8	4	16	3,000	....
Laredo	..	..	1	8	..	2	2,250	Bell
New Braunfels	..	..	2	6	2	2	3,200	Anderson
Palestine	..	..	..	4	..	..	4,600	Phone
Port Arthur	..	..	..	..	..	..	9,000	Star
San Marcos	..	..	1	8	..	2	2,700	Phone
Seguin	..	..	..	..	1	1	3,000	Phone
Victoria	..	..	8	6	16	5	4,000	Gamewell
Utah:								
Brigham	..	..	2	8	..	..	2,300	Bell
Logan	..	2	3	..	4	..	3,000	Phone
Ogden	1	2	6	12	6	6	7,872	Gamewell
Salt Lake City	1	11	10	20	..	..	20,000	....

AUXILIARY FIRE EQUIPMENT (Continued).

City and State	Lung-motors or Pul-motors	Oxygen Helmets	Search-lights	Hand Extinguishers	Solid Tires	Pneumatic Tires	Feet of Hose	Type of Alarm System
Vermont:								
Bellows Falls	..	..	..	..	..	..	8,000	Gamewell
Bennington	..	..	..	5	..	..	4,100	Gamewell
St. Johnsbury	1	..	..	26	1	..	5,200	Gamewell
Virginia:								
Bedford	..	..	..	6	..	..	1,000	Bell
Charlottesville	..	..	..	4	..	..	5,000	Bell
Covington	..	..	1	4	..	1	3,000	....
Harrisonburg	..	..	..	..	..	..	2,000	....
Lynehburg	..	..	..	..	..	..	12,000	Gamewell
Newport News	..	..	3	10	32	4	9,000	Stevens, Star and Gamewell
Roanoke	..	..	..	8	..	..	12,000	Gamewell
Staunton	..	2	1	8	..	..	3,000	....
Washington:								
Bellingham	1	..	..	6	..	..	9,000	Gamewell
Chehalis	..	..	1	2	..	..	2,200	Gamewell
Ellensburg	1	1	1	2	..	..	3,500	Gamewell
Olympia	..	..	2	6	..	1	5,000	Gamewell
Port Townsend	..	..	1	7	..	..	3,500	Gamewell
Puyallup	..	..	4	4	..	..	2,000	Phone
Seattle	4	17	25	68	..	6	100,000	Gamewell
Taeoma	..	3	..	50	..	2	41,000	Star[8]
Walla Walla	..	2	2	8	12	10	6,550	Gamewell
West Virginia:								
Elkins	..	..	1	4	..	..	2,000	Whistle
Fairmont	2	4	3	11	2	4	4,200	Phone
Keyser	..	..	2	2	2	..	1,500	Siren
Martinsburg	..	..	1	12	8	4	4,500	Phone
Princeton	..	..	..	..	..	6	10,000	Whistle
Sisterville	..	..	..	..	..	..	2,000	Gamewell
Wheeling	1	8	1	16	8	4	16,000	Gamewell
Wisconsin:								
Antigo	..	..	1	8	4	..	5,200	Phone
Appleton	1	..	2	9	..	..	6,500	Gaynor
Ashland	..	1	1	2	4	..	6,000	Gamewell
Berlin	1	2	1	5	..	..	3,200	Bell and Phone
Fond du Lac	1	..	2	9	2	20	10,400	Gamewell
Ft. Atkinson	1	..	1	4	..	..	2,500	....
Grand Rapids	1	..	1	12	..	..	3,600	Phone
Hudson	..	..	..	2	..	..	2,500	Metropol'n
Jefferson	..	..	..	4	..	..	1,800	Bell and Whistle
La Crosse	..	2	..	14	..	..	13,000	Gamewell
Manitowoc	1	..	3	8	..	2	5,200	Gamewell
Merrill	1	..	2	5	..	..	6,000	Phone
Milwaukee	2	9	17 (2)	57 (13)	..	20	93,100	Gamewell
Oshkosh	..	..	2	8	..	..	15,000	Gamewell
Plymouth	..	..	..	..	..	..	3,500	....
Portage	1	..	..	..	..	..	3,000	....
Rhinelander	1	..	1	9	..	..	4,250	Gamewell
Shawano	1	..	..	2	..	..	2,500	Whistle
Stoughton	..	..	1	4	6	..	2,600	....
Superior	2	2	..	30	..	..	13,000	Gamewell
Waupun	..	..	1	2	..	..	2,000	Bell and Whistle
West Bend	..	..	..	5	..	..	1,800	Bell and Whistle
Wyoming:								
Evanston	..	..	..	..	..	..	600	Phone
Canada:								
Westmount	..	..	2	12	8	4	7,200	Gamewell

[1]Owned by police department; [2]smoke filters; [3]smoke masks; [4]on cars; [5]mounted on water towers; [6]on each; [7]own installation; [8]Star repeater and switchboard with both Star and Gamewell boxes; [6]two on each piece of motor apparatus.

The WEEK'S NEWS

Suspend Priority Order No. 2—State Highways in Illinois and Connecticut—Sewage Disposal Problems in Syracuse—Malaria Control in New Jersey—Natural Ice Endorsed by Food Administration—New Hydro-Electric Power Plant Opened by Los Angeles—Government Controls Niagara Falls Power—Firemen Killed and Injured in Two Auto Crashes—Two-Platoon System in Minneapolis—Fires in Indianapolis and Darien—New City Managers Assume Office in Nine Cities—Cities Vote For and Against Commission Form.

ROADS AND PAVEMENTS

Government Rail Control Suspends Priority Order.

Washington, D. C.—Following the institution of federal control of the railroads of the country, an order has been issued by judge Robert S. Lovett, administrator of priority and transportation, suspending all priority orders, including order No. 2, which has so vitally affected road-building and maintenance. While it is not known what orders will be issued following reorganization of the railroad system, city, county and state highway officials are preparing to resume work at the close of winter on those highways which are needed to carry the increased traffic due to war conditions.

Increasing Use of Illinois Roads.

Springfield, Ill.—A total of 91,862 more automobile licenses were issued by the state of Illinois during 1917 than in 1916, according to the annual report of secretary of state Louis Emmerson. Fees of the automobile department for the year just ending, including moneys for motor cycle, chauffeurs' and dealers' licenses, the report states, amounted to $1,588,811, or an increase of $352,245 over 1916.

City Wins in Paving Suit.

Portland, Ore.—In a decision handed down in the case brought by a property owner to restrain the city from collecting an assessment made for a street improvement the state supreme court orders the suit dismissed and the city to collect the amount due. The city started proceedings for the improvement of the street, but before the work was completed, owing to an error in the description of the property affected, it was found that the proceedings called for the improvement of only one-half the thoroughfare. The owner of all the property affected by the improvement appeared before the council and requested that the entire street be paved and agreed to pay for the improvement. Accordingly, to cure the error, the city instituted proceedings to pave the entire thoroughfare, and when the work was finished and the assessment made the owner brought suit to enjoin the city from collecting the amount due and circuit judge Gatens decided the case in his favor. The city appealed the case to the supreme court with the result that the decision of judge Gatens was set aside and the case awarded the city. In its conclusions on the case, the supreme court makes the statement that the case "savors strongly of an attempt to get something for nothing, which is inequitable even as against a municipality."

New Road Opens Up National Forest Region.

San Francisco, Cal.—A road connecting the Imperial Valley-San Diego state highway with the Laguna mountains will be completed early this year according to a statement by the acting district forester. This road will be a lateral of the state highway, ten miles long, and will cost approximately $30,000. It will have an average grade of 5 per cent, and nowhere will it be more than 8 per cent. The completion of this road will throw open for recreation purposes one of the finest outdoor regions in the national forests in California. The Lagunas have hitherto been comparatively inaccessible. The chief feature of the Laguna region is a broad plateau of about 5,000 acres containing long rolling meadows, streams and lakes. The altitude of the plateau is between 5,500 and 6,300 feet. The forest service has reserved the entire region for the recreation seeker. Under the direction of Frank A. A. Waha, professor of landscape engineering of Amherst college, and consulting engineer of the forest service, the tracts have been surveyed and subdivided for building purposes and for public camp grounds. Lots averaging half an acre in size will be rented by the government for summer homes and permanent camps. Sites have been reserved for public, municipal and playground camps, athletic fields, including baseball diamonds and golf courses. More than 500 lots will be available for occupancy in the spring and more will be laid out as needed. The Lagunas can be reached within about 25 miles by railroad from Campo, and upon the completion of the new auto road will be three or four hours away from San Diego and El Centro by automobile.

Money for Connecticut's Road Plans.

Hartford, Conn.—According to the accounts of the state highway department of Connecticut for the year ending September 30, the amount of funds on hand totals $340,266.91. All but $11,418.87 is available for the use of the department during the coming year. This leaves an unexpended balance of $328,788.04, the $11,418.87 being turned over to the state treasurer. This department is not subject to the rule that makes it necessary for a department to turn over its unexpended balances at the end of the year. As appropriations of $6,100,000 were voted at the last session of the general assembly there will be adequate money on hand for the uses of the department for the next two years. Roads already built can be maintained at a high level of efficiency and much new construction undertaken. There are still some gaps in trunk line systems to be filled in, but the work is being done as rapidly as possible.

SEWERAGE AND SANITATION

State Demands Adequate Sewage Disposal.

Syracuse, N. Y.—Demands that the city proceed immediately to carry out an acceptable plan for disposing of its sewage have been made upon mayor Walter R. Stone and the intercepting sewer board by the state department of health. The state refuses to permit the city to put off for another year the adoption and carrying out of a plan whereby sewage will be removed from Onondaga creek and the barge canal harbor. All of the city's sewage now flows directly into the harbor and while it will not become objectionable within a year, it must be diverted without unnecessary delay. According to Henry C. Allen, city engineer, the city is only awaiting the result of tests now being made by Glenn D. Holmes, chief engineer of the intercepting sewer board, to determine whether the activated sludge or aerated-filter system is best suited to conditions. Funds for beginning the work will not have to come from the 1918 tax levy, which the administration will make up next month. Under special legislation covering the sewer system, the intercepting sewer board has power to borrow an adequate amount through bond issues authorized by the common council. City bonds are unmarketable at present because the law stipulates that they may carry interest at a rate no higher than 4½ per cent. Plans have been made, however, to change the law and the board will be able to issue sufficient bonds to start work on a disposal plant in 1918. Removal of the municipal bathhouse from the salt marsh, which the city is trying to accomplish through an ordinance recently passed by council, is the first step in the city's effort to comply with the demand of the state. The tract on which the bathhouse stands will be used for a sewage disposal and incinerating plant, steam from the latter supplying power at a low cost to run the disposal system and also to pump water from the sulphur springs to the new bathhouse. Many methods of sewage disposal have been considered by the intercepting sewer board in studying the needs of Syracuse. Choice has finally narrowed down to two methods which the board is testing out at an experimental station. At the testing station crude sewage is pumped to a grit chamber thirty feet long and forced through a coarse screen of inclined bars with three-fourths of an inch spacing. Part of it then enters an activated sludge tank and the rest goes into two Dortmund tanks, one with a horizontal flow filter and the other with a vertical flow aerated gravel filter. Jacob Cohen, engineer in charge of the station, collects samples of sewage hourly, observing the result of tests in both systems continually. Engineers are unwilling to express an opinion, but they are satisfied that either will work here satisfactorily. The choice probably will be dictated by comparison of costs. The intercepting sewer board engineers appear to be unwilling to make a final decision until they have a chance to test both systems under warm weather conditions.

Want Convict Labor for Mosquito Elimination.

Trenton, N. J.—Reclamation of salt marsh lands of the state in the ensuing five years at an expenditure of $750,000 is advocated by the New Jersey State Department of Conservation and Development as a means of increasing the ratables of the state by at least $500,000,000 within the next twenty years. These salt marsh lands are now mosquito breeding places, but with the elimination of the mosquito pest in the marsh lands this now worthless property would be made valuable. Up to this time the marches in Essex, Bergen, Union, Middlesex and Monmouth counties have been so nearly completely drained that the original area of mosquito breeding places has been reduced to an almost negligible fraction. Progress in the work of draining the marshes in Ocean and Atlantic counties is well advanced and Cape May County has made a good beginning. In Cumberland and Salem counties about 100,000 acres of marsh land—about one-third of the marsh area of these counties—has not been touched in the draining and reclamation work. It is pointed out by the department that although thirteen counties of the state are spending $213,385 this year for mosquito extermination work, most of it for fresh water control, the state's appropriation for this kind of conservation and development in the salt marsh areas is but $10,000, an amount declared to be entirely disproportionate and inadequate. The department believes that convict labor can be employed to great advantage in the program of draining and reclaiming the salt marsh lands and elimination of the mosquito pest. It is pointed out that the department is in hearty accord with the state use system of convict labor.

Food Administration Approves Pure Natural Ice.

Washington, D. C.—According to a statement by the United States Food Administration, one of the best opportunities of conserving ammonia is made available by the substitution of natural ice for the manufactured product. This substitution is being provided for throughout the country, and it is expected that a very large percentage of the ice used next summer will be ice that the Food Administration is encouraging people to harvest now from rivers and ponds wherever possible. A serious obstruction in the way of this splendid opportunity of providing an urgently needed chemical for the army and navy is caused by the fact that several large cities have restrictions against the use of natural ice. It is obvious, says the administration, that municipalities should not permit the use of polluted ice. There is much misapprehension and prejudice concerning the use of natural ice that careful consideration and study will dispel. To any boards of health, etc., interested in this subject, the Food Administration will be glad to send any of the following booklets (published by Natural Ice Association of America, 18 East 41st street, New York City):

Status of Scientific Opinion of the Purity of Natural Ice.
The Effect of Handling and Storage on the Safety and Purity of Ice.
Non-Relation of Natural Ice to Typhoid Fever and Dysentery.
The Purity of Natural Ice.
The Bacteriology of Ice.
The Sanitary-Chemical and Bacteriological Examination of Natural Ice.
Melted Natural Ice Compared with Bottled Spring Water for Drinking.
The Study of the Purity of Natural Ice from Polluted Water
Melted Natural Ice vs. Bottled Spring or Distilled Water for Drinking.
Bacteria in Natural Ice.
Natural Ice and the Public Health.
Factors of Sanitary Safety in a Natural Ice Supply.
Water from Melted Natural Ice for Domestic Use.

WATER SUPPLY

Find Big Leak After Long Search.

Huntington, Ind.—For over two weeks the city waterworks officials were puzzled over an increased pumpage of about 400,000 gallons per day which could not be accounted for and which at times tended to reduce the pressure to a dangerous degree. It was found that no large valves were being opened by big water users at these times. Some broken service mains were found but these were not large enough to let any large amount of water get away. Detection was difficult because of the fact that the sewers were flooded from snow water, and any extra amount of water could not be detected. J. F. Fulton, superintendent of the waterworks, thought for a time that the cold weather and the practice of letting taps run to prevent freezing would account for the excess pumping that had to be done, but warmer weather brought no relief. Finally a leak in a six inch hydrant line was discovered. With the passing of the surface water from the streets, and the lowering of the water in the Flint Creek sewer, the men were able to discover a big stream coming from an eight-inch sewer. This stream was several inches deep, and was so much clearer than the usual sewer water that the men used their detecting equipment on this line and found the leak.

Newark Helps Jersey City With Water.

Jersey City, N. J.—Newark has been supplying Jersey City with 5,000,000 gallons of water a day as an emergency measure to meet the shortage there. The supply was piped by the East Jersey Water Company to a Jersey City connection with its Bayonne feed line. Newark's pipe line and that of Jersey City running from the Boonton reservoir run parallel near the Belleville reservoir and an effort was made to connect them at that point, thereby furnishing the supply direct, but it was found that the Jersey City pressure was so much greater than that of Newark that the water backed up. Director Raymond and chief engineer Sherrerd of Newark and director Fagen and chief engineer Van Keuren of Jersey City then decided on an arrangement whereby Newark turns 5,000,000 gallons a day into the pipes of the East Jersey Water Company near Little Falls and the company gives an equal amount to Jersey City from the Bayonne feed line. Railroads and industrial plants have been seriously hampered by the water shortage. As an aid to the city, the railroads have had locomotives fill their tanks before entering the city, thereby getting a sufficient supply to carry them in and out again.

City Increases Water Rates.

Brockton, Mass.—Conditions have forced the water commissioners to establish a new schedule of water rates, which is considerably higher than the tariff hitherto in force. The reasons given for this increase by the commission are the continued neglect of the city council to make a sufficient additional appropriation to meet the needed expenses of the department, and the great increase in the cost of materials, coal and labor. The commission says that for a number of years the water commissioners, in their annual reports, have called the attention of the city council to the need of more money to meet the necessary expenses of the department, and have recommended an appropriation for hydrant rental. This recommendation has not been heeded until this year, when the inadequate sum of $3,000 was appropriated. The present water tariff establishes a charge of 17 cents per 100 cubic feet to all users of 200 cubic feet or less per day. A rate of 15 cents per 100 cubic feet is charged consumers of an average of between 200 and 300 feet and all supplies in excess of 300 feet per day are assessed a flat rate of 10 cents per 100 cubic feet for all water used. The revised schedule is a radical departure from the present scale, both in price and classification.

Class A—For the first 18,000 cubic feet of water per quarter or any part thereof, domestic rate of 17 cents per 100 cubic feet.

Class B—For water in excess of 18,000 cubic feet and under 27,000 cubic feet, per quarter, intermediate rate of 13 cents per 100 feet.

Class C—For water in excess of 27,000 cubic feet, per quarter, the manufacturing rate of 8 cents per 100 cubic feet.

For each service supplied there will be a charge for service and meter, per quarter, to be known as meter rent, as follows:

Pipe Size.	New Price.	Old Rate.
⅝ inch	$0.55	$0.25
¾ inch	.70	.45
1 inch	.80	.68
1¼ inch	.90	.90
1½ inch	1.40	1.05
2 inch	1.75	1.56
3 inch	3.50	2.50
4 inch	5.00	5.00
6 inch	12.50	12.50

In the new meter schedule certain meters are not subject to charge in rental. Supt. Horace Kingman explains these are for pipes which are used in outside supply, carrying water to suburban districts where the flow is separated and distributed to many residential and industrial users.

STREET LIGHTING AND POWER

Los Angeles Opens New Hydro-Electric Plant.

Los Angeles, Cal.—With appropriate exercises by officials and citizens the city has opened the new hydro-electric plant located near the Los Angeles river at its juncture with the Franklin canyon pipe line, three miles north of Universal City. The plant is producing 4,000 horse power. The cost of building the new plant was $120,000, out of power revenue fund, without additional cost to the taxpayers. According to E. F. Scattergood, chief engineer of the power bureau, "the building of the plant constitutes the second step in the development of the city's magnificent 217,000 horse power hydro-electric power project.

"Water for operating this plant is taken directly from the Franklin canyon pipe line—the 64-inch steel pipe line crossing the San Fernando valley and connecting the San Fernando reservoir with the reservoirs in the Franklin canyon. It enters the power house under a pressure head of 450 feet and after performing its duty, is discharged directly into the Los Angeles river. When operating under full head, it will have a generating capacity of 4,000 horsepower. The significance of this capacity and the importance of the plant as a unit in the entire system can be more readily understood when it is explained that operation will be continuous throughout the 24 hours of the day, and that under reasonable operating conditions the output will be about 2,000,000 kilowatt hours per month.

"The total cost of construction, including power house building, machinery and transmission line, has amounted to only $30 per horse power.

"The purpose of the plant is to supplement the output of the San Francisquito canyon plants during the winter season, when the demand for electric power for street lighting and domestic and commercial purposes within the city is at its maximum and, therefore, most needed and most valuable, and when the demand for water for domestic and irrigation purposes is a minimum. It will operate during the nonirrigation season only—that is, from the time when the use of water for irrigation purposes begins to fall off in the late summer or early fall until irrigation is again at its height in the spring or early summer.

"Valued conservatively, the sale of power from this plant, after deducting necessary operating expenses, will in two years' time, if operated to full capacity, amount to more than the cost of installation.

"It must also be remembered in connection with the water to be used at this plant, that the 5,000 inches, or 100 second feet to be there used, has already been used for power generating purposes at plant No. 1.

"This second use will produce power having a value of about $27.50 per hour, if figured on a delivered efficiency at the point of sale of 75 per cent of the potential power of the water, and a sale price of 1 cent per kilowatt hour for the power, so that considering its use in both plants, it will be earning about 1.6 times its value as water for irrigation at present city rates.

"As a matter of fact, this plant can only be run in the non-irrigating season, when the use for water for such purpose is low or even negligible, and the demand for power is great.

"The water, however, will not be wasted, even though permitted to flow liberally down the Los Angeles river, as a considerable percentage will be absorbed by the gravels in the neck of the San Fernando valley and will reappear with the summer flow of the Los Angeles river above the points of intake of the water works, which are located seven, 10 and 17 miles, respectively below the location of this plant.

"Even the water which passes the lower one of these locations, without appropriations by the city, is lost only as to its use for the inhabitants of the city, for the reason that it goes to replenish the water of the immense coastal plain, lying between the south boundary of the city and the sea, from which it is readily available for summer use by the thousands of pumping plants located in this fertile area, and which produces annually crops running into the millions of dollars—a permanent source of wealth to the city's welfare."

No publicity was given to the fact that the plant was being constructed because of a desire by the city officials to avoid being hampered by injunction suits or other obstructions, which it was feared would be thrown in the way of the proposal, by enemies of the municipal power program. Mayor Woodman says he will take steps at once to finance the construction of the fourth aqueduct power plant, which is officially designated as power plant No. 2 in the San Francisco canyon.

Gas Consumers Organize.

Charleston, W. Va.—The West Virginia Gas Consumers' Association, which was recently organized here following a conference between Governor Cornwell and a number of representatives of municipalities and manufacturing concerns in the northern part of the state, has been issued a charter by the secretary of state. The purpose of the association, as stated in the application for the incorporation papers, is the "conservation of natural gas for the consumers in West Virginia." The association is expected to file a formal complaint with the public service commission to require gas companies to furnish an adequate supply of gas to consumers in this state.

Vote Against Purchase of Power Plant.

Eaton Rapids, Mich.—There was only about two-thirds of the normal vote of the city cast at the special election held here to vote on the proposition to bond the city for $30,000 to buy the Smithville water power. The proposition failed to carry by the necessary majority when it was voted on at the regular municipal election a month previous, and was again defeated, the majority not being great enough to carry it through. The vote was 230 for to 202 against the proposition.

Niagara Power Under Government Control.

Niagara Falls, N. Y.—Under authority of the president the electric power produced, imported, and distributed by the Niagara Falls Power Company, the Hydraulic Power Company of Niagara Falls, and the Cliff Electrical Distributing Company has been requisitioned by the Government. This step was taken to assure an adequate supply of electric power for the establishments engaged in war work at Niagara Falls and Buffalo. Canadian demands that approximately 100,000 horse power of current imported from the Canadian side be applied exclusively to war work were said to have been a determining factor in the government's decision to requisition all power. Among the first orders following requisitioning was one closing down two paper mills using about 5,500 horse power. Other companies reduced their power consumption somewhat. Approximately 110 factories not working directly on war contracts will curtail their electric power requirements somewhat, will use power at times when munitions factories are making their smallest demand, and will substitute steam for electricity as much as possible. The situation is being investigated by Robert J. Bulkeley, of the War Industries Board, and Col. C. Kellar, chief. engineers' office, U. S. Army.

FIRE AND POLICE

Chief and Three Others Killed in Collision.

San Antonio, Tex.—W. P. Bishop, chief of the San Antonio fire department, and Robert Kopplin, acting lieutenant of the department, were instantly killed, Bishop's chauffeur and a ten-year old boy were fatally injured so that they died later, and nine others, including three soldiers, were seriously hurt when the automobile in which the fire chief was going to a fire collided with an automobile fire truck traveling at right angles. The force of the collision hurled the cars across a sidewalk through a crowd of New Year's merrymakers, and through the windows of a department store. Several of the injured were cut by flying glass. Both machines, worth about $16,000 together, were badly wrecked. Chief Bishop was 54 years old and had been in the department 22 years.

Abolition of Two-Platoon System Illegal.

Minneapolis, Minn.—The city council has no power to abolish the two-platoon system in the Minneapolis fire department, according to attorney-general Lyndon A. Smith in an opinion to the council. The attorney-general's opinion was given to senator Campbell in answer to a direct question as to the constitituonality of the law. He said the council must find some means to finance it. The council finance committee recommended to the council, however, that the recent increase of salary to all members of the police department of $10 a month be reduced to $6.50 a month, placing firemen and first-class patrolmen on the same salary basis of $101.50 a month. The resolution provided that no member of the department receiving more than $1,800 a year should be granted a salary increase. This provision prevents increases in the salaries of chief Harthill, O. M. Wassing, secretary to Mayor Van Lear, chiefs of detectives, captains and other department heads.

Industrial Building Fire Causes Big Loss.

Indianapolis, Ind.—Fire which started in the Industrial Building, which housed thirty manufacturing concerns, destroyed the building and adjoining property, causing a loss estimated at $1,000,000. Fire chief Loucks said he believes that the fire was of incendiary origin. Several of the manufacturing companies were making machinery for the government under war contracts. Six dwellings, a church, grocery and saloon also were burned. No lives were lost, although falling walls placed firemen in great danger and hindered them in their work by cutting line after line of hose. The flames spread rapidly, fanned by a high wind, which sent showers of sparks throughout the neighborhood. The industrial building, 600 by 200 feet, consisted of four stories and a basement, all occupied. The structure was of brick, built in five sections, and one of the biggest plants of its kind in the city.

Police Chief Suspended.

San Antonio, Tex.—Fred Lancaster, chief of police, and J. E. Wilkins, judge of the police court, have been suspended from office by the city commission as a result of a report submitted by the Citizens' Anti-Vice Committee. A formal trial on the charges against them, which were altogether impersonal, will be held later. Mayor Sam C. Bell, who recommended the suspension after considering the committee's report, announced that a thorough reorganization of the police department would be effected immediately, to the end that the War Department's often repeated demands for better moral conditions here may be complied with. After an exhaustive investigation with the co-operation of the military authorities at the various camps in and around San Antonio, the citizens' committee, composed of five men, reported that the chief of police had not been sufficiently active in stamping out vice and that the judge of the corporation court had not been severe enough with offenders brought before him. The committee made it plain that it had found no indications of attempts at corruption on the part of the two officials whose suspension it recommended. The committee said that evi conditions here had been exaggerated in reports sent t Washington, but contended that nevertheless there hac been too much laxity in the enforcement of ordinances designed to protect the morals of the community.

Four Injured in Crash of Fire and Police Cars.

Lynn, Mass.—Four Lynn city officers were injured, one it was thought fatally, when the fire department automobile bearing district chief William Welch, with his driver, William Nihan, and a police automobile containing reserve officer George Nihan, a brother of the driver of the fire department automobile, and house officer Matthew Casey, crashed together at a street corner. At the time both were answering an alarm for a trifling fire, which was put out before the firemen arrived. The cars were going at top speed. The police automobile was upended and turned over, burying its occupants. The occupants of the fire department automobile were thrown headlong to the street, receiving cuts and bruises, but being uninjured otherwise.

Fire Equipment Inadequate, Business Section Destroyed.

Darien, Conn.—A fire with a loss estimated as high as $75,000 to $100,000, and with which Darien's volunteer fire department, with its insufficient apparatus and small numbers, was wholly unable to cope, swept the heart of the business center of Darien, wiping out eight places of business entirely, and crippling three more, besides rendering several persons homeless. Help came from Noroton Heights, New Canaan, Norwalk and Stamford, and, but for the timely arrival of a motor fire engine from Stamford, probably twice the number of buildings would have been consumed. The fire was caused by a plumber's torch used in thawing out frozen pipes. The flames were fed by a 350-gallon oil tank and the wooden building, and the department found itself helpless when it arrived. The firemen were greatly handicapped by poor pressure from the hydrants and only the Stamford men had a pumping engine.

GOVERNMENT AND FINANCE

Soldier Vote Elects Mayor.

Mount Vernon, N. Y.—The contest in the courts to determine who was elected mayor of this city, which resulted in twenty court orders being issued for the inspection of ballots cast by soldiers, came to an end when the Westchester County Board of Supervisors, acting as county canvassers, issued a certificate of election to Dr. Edward F. Brush, the Republican nominee. Mayor Edwin W. Fisk, Democrat, who claimed his re-election by two votes, lost in several court proceedings. According to the canvass of the supervisors, Dr. Brush won by seven majority. For a time the result hinged on the votes of four members of the "Rainbow Division" in France. The vote in the city gave Dr. Brush a plurality of 58, but according to the official count of the soldier vote, Fiske received 168 and Brush 110, which gave a tie vote. A number of defective ballots and clerical errors were challenged.

Manager City in Pennsylvania.

Altoona, Pa.—Under decidedly unusual circumstances, this city has inaugurated the manager plan, which experiment is being watched carefully by the other municipalities of the state. During the last election four business men ran on a platform urging the commission-manager form of government. With the aid of the chamber of commerce and advertising they succeeded in breaking the "city hall ring" and were elected. The campaign began with the discovery by city solicitor T. C. Hare that the Clark act of 1913 allowed third-class cities to appoint a city manager. While the appointee could legally be paid any salary, the candidates for commissioners decided to save the city money. In keeping with their pre-election pledges, the commissioners have returned $2,000 out of their $2,500 salaries to maintain a fund from which the city manager is to be paid.

The commissioners are four of the city's most successful business men: W. C. Westfall, president of the chamber of commerce; Charles H. Cassidy, a building contractor, and John P. Lafferty and N. A. Stevens. They have appointed as manager H. Gordon Hinkle, an engineer, formerly of Philadelphia. Mr. Hinkle began as a division engineer with the People's Traction Company in Philadelphia and later joined the staff of the Union Traction Company in the same city, remaining until 1900. Then, as superintendent of construction, he became connected with the American Railways Company of Philadelphia. He laid and reconstructed tracks, put up overhead lines, built power stations and other public utility equipment in a number of cities. In 1906 Mr. Hinkle went into engineering on his own account and then he became county engineer in 1909. He was also president of a contracting company. He has held the office ever since, and his friends in the chamber of commerce and the commissioners-elect themselves declared that Mr. Hinkle "has done wonders for Blair county's roads."

Vote to Give Up Commission Form.

Portage, Wis.—Portage is the second city in Wisconsin to vote out the commission form of government in the last few months. After six years' trial, Portage electors rejected the commission form by more than a two to one vote.

Begins City Manager Regime.

Brigham City, Utah.—Brigham City is now under the city managerial form of government, Charles O. Roskelley, civil engineer, and for a number of years a member of the Boxelder high school faculty, where he has been in charge of athletics, having been appointed by mayor-elect John W. Peters and all the councilmen. A careful study has been made of the new form of government and all the leading citizens, as well as the new officials, are confident that the change will be successful. Mr. Roskelley was the councilman-elect from the third ward for the four-year term.

"Alien Enemy" Mayor Takes Office Amid Protests.

Michigan City, Ind.—Fred C. Miller, elected mayor of this city last November, but classed as an "alien enemy," has taken office as mayor despite efforts to prevent him. There was no disorder, as expected in some quarters. The effort to obtain a judge to try the injunction suit brought by mayor Martin T. Krueger to prevent Miller taking office failed and the appointment of a judge was left to Governor Goodrich, who is expected to take action soon. Mayor Krueger is leading the fight against Miller. Miller has applied for first naturalization papers, which qualifies him as a voter in Indiana. His adherents say he is legally qualified to hold office. It is reported that President Wilson will not take any action in the mayoralty contest, the attorney general having found that the federal government has no jurisdiction. The President's decision followed a request by senators New and Watson that the President take steps to prevent Mr. Miller becoming mayor of Michigan City and urging that the regulations governing enemy aliens be changed to prevent them holding public office.. There is a hint that former Mayor Krueger has neither first nor second naturalization papers.

Charter Requires No Bidding on Purchase of Materials.

San Francisco, Cal.—Judge John T. Nourse has let down the bars for the purchase of supplies and materials for the Hetch Hetchy work without solicitation of bids and advertising for proposals, having decided that there is no section of the charter requiring such competitive bids in connection with the construction of a public utility. The point was raised on the application for a writ of mandate against auditor Boyle to force him to audit the demands on the treasury of Edward L. Soule for fabricated steel, which had been purchased through the city engineer's office for use in the Hetch Hetchy work, without competitive bids. Relying on the decision in the Neal Publishing Company case by the late judge Seawell, which held that the charter provision demanding competitive bids refers to "public work" and not to the purchase of materials, judge Nourse directs the auditor to approve the Soule demand, and says therefore: "It is necessary for the defendant to show that such competitive bids are required by reason of the provisions of some ordinance of the board of supervisors. If, therefore, any such ordinance exists it is necessary for the defendant to plead it, because the court is not authorized to take judicial notice of ordinances of the city and county."

Mayor Ousted.

Glenwood, Ia.—E. J. Wallace, mayor of this city, has been removed from office by a decision handed down by Judge Hutchinson of the Polk county district court. The removal proceedings were started by assistant attorney general J. W. Kindig.

City Votes for Commission Form.

Biloxi, Miss.—By an overwhelming majority the voters have decided in favor of the commission form of government. The returns gave 340 for to 43 against. The proposition was defeated at two previous elections. According to the new plan, the commission will consist of two commissioners and a mayor, who will enter office the first of next year. While the election was in progress, the city board of aldermen and mayor were firing the whole police force and choosing a new one. The officials stated they considered a clean sweep in the police department a good thing for the city. Men who have been on the force for ten and twelve years were ousted.

New City Managers.

East Cleveland, O.—The newly appointed city manager has taken over the government of the city with declaration that "there isn't going to be any politics." He is C. M. Osborn, formerly city engineer of Lorain. He is 43 years old.

Santa Barbara, Cal.—This city's advertisements for a city manager brought about four hundred applications and the commission has chosen Robert A. Craig, who has been city manager of Phoenix, Ariz., for two and a half years. Mr. Craig is a mechanical engineer, having been graduated from the University of California and having experience of a number of years in public utility operation. He will receive a salary of $7,500.

Albuquerque, N. M.—The commissioners have appointed Paul C. Reddington city manager. Mr. Reddington was a resident of the city.

Phoenix, Ariz.—To take the place of Robert A. Craig, who has gone to Santa Barbara, the city commission has appointed V. A. Thompson new city manager. He was previously superintendent of streets and waterworks, and his salary will be $5,000.

Sault Ste. Marie, Mich.—The new city commission had almost 500 applicants to choose from and finally appointed J. H. Moore city manager at a salary of $3,600. Mr. Moore was before that commissioner of public works of Evanston, Ill., for 16 years.

Cadillac, Mich.—The city commission recently elected has appointed George Johnston city manager to succeed T. V. Stephens. The new manager has served the city several years as city clerk. He will receive a salary of $2,000.

Ashtabula, O.—Mervin T. Turner, a former public service director, has been appointed city manager by the new commission. He succeeds J. Warren Prine, formerly postmaster, who was appointed city manager two years ago and now assumes charge of the Ashtabula Coal company, which he owns. The new city manager served four years as director of public service, from 1912 to 1916. Previous to that he was in the hardware business and later in the real estate business.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Payments by Warrant—Illegal Payments.

(Wash.) Under Rem. & Bal. Code, § 7687, providing that all demands against cities of third class shall be paid by warrants specifying purpose for which they are drawn, action of treasurer of such city in paying claims in cash without warrant was illegal.—City of Hillyard v. Carabin, 165 P. 381.

Limitation of Indebtedness.

(Ky.) In determining amount of indebtedness of city of third class within Const. § 158, prohibiting such city, having population of over 15,000, from incurring indebtedness, which, with existing indebtedness, exceeds 10 per cent. of value of taxable property, indebtedness created prior to adoption of Constitution should not be considered.—Kimbley v. City of Owensboro, 195 S. W. 1087.

Valid Indebtedness—No Funds—Recovery.

(Cal.) Where an indebtedness against a city was valid when incurred, a subsequent exhaustion of funds from which it could be paid only affects the remedy to obtain payment, and does not prevent judgment being secured for amount due.—Arthur v. City of Petaluma, 165 P. 698.

Issuing Bonds—Accrued Interest.

(Miss.) Where county issued bonds, payable to bearer, and bonds were delivered to bidder therefor, without payment of accrued interest, with receipt acknowledging payment and certificate of regularity, county was liable to bona fide purchaser for accrued interest.—Beiser v. Supervisor's Dist. No. 2 of Smith County, 75 So. 594.

Lease to Saloon—Prohibition—Liability for Rent.

(Utah.) Where city leased premises for bathing resort with provision that portion might be sublet for saloon purposes, the fact that subsequently, pursuant to Laws 1911, c. 106, city by ordinance prohibited saloon business on such premises, did not constitute an eviction or release lessee from paying rent or entitle him to any abatement thereof.—Warm Springs Co. v. Salt Lake City, 165 P. 788.

Defective Street—Notice.

(Neb.) Rev. St. 1913, § 4583, requiring written notice of defective street to be filed with city clerk five days before occurrence of injury complained of, does not apply where defects were obvious and existed when city opened street, without guarding or warning against them.—McMasters v. City of Lincoln, 163 N. W. 319.

Defective Street Liability.

(Mass.) A city's liability for keeping street so slippery as to cause automobile to skid into plaintiff is based on its duty to keep its streets reasonably safe for travel, and is not dependent upon its liability for negligence of an employe in oiling street.—Kelleher v. City of Newburyport, 116 N. E. 806.

City Addition Plats—Approval.

(Iowa) Under Code 1897, §§914-916, specifying contents, etc., of city addition plats and providing that council shall approve plats conforming to specifications, council has no discretionary power to withhold approval until a bond be furnished indemnifying city against possible expenditures for street improvements in proposed addition.—Carter v. City Council of City of Council Bluffs, 163 N. W. 195.

Power of Commissioner to Act Beyond Petition.

(Vt.) Under P. S. 3878, 3879, held that street commissioners were without jurisdiction to act on any question of raising a roadbed where the petition did not show such question was to be considered.—Collins v. City of Barre, 101 A. 43.

Addition Plats—Approval.

(Ill.) Under Hurd's Rev. St. 1915-16, c. 109, while the city council may by ordinances require every plat of a proposed addition to be submitted to it or to an officer for approval, it cannot by failing to pass an ordinance reserve an arbitrary discretion.—People v. Massilon, 116 N. E. 639.

Contractor's Bond—Suit for Materialmen.

(Mo.) Where bond of one who has contracted with city to construct flow line provides that suit may be entered on bond by city to use of any materialman at his instance, such suit may be brought by city at relation of materialman.—City of St. Louis v. Parker-Washington Co., 196 S. W. 767.

Right of Municipality to Direct Surface Water.

(N. J. A municipality has no right by artificial drains to divert surface water from its course and cast it in a body large enough to do substantial injury on land, where but for the drains it would not have gone.—Jerolamon v. Town of Belleville, 101 A. 244.

Benefits and Assessments—Determination.

(N. J. Sup.) Whether lands assessed for benefits resulting from extension of street, and situation 3,200 feet from place of extension, were specially benefited, and to what extent, is a question of fact for determination by the commissioners.—Jenkinson v. Parmly, 101 A. 390; Fiedler v. Same, Id. 391.

Paving Street—Charging Benefits.

(Mo. App.) Premises, in front of which street has been paved by street railroad company, as consideration for grant of franchise, should bear share of cost of the entire improvement proportionate to its frontage on street, regardless of cost of work there, where charter provides that city shall charge each lot with its proper share of cost of paving according to frontage of land on street paved.—Municipal Securities Corp. v. Metropolitan Street Ry. Co., 196 S. W. 400.

Paving Work—Benefit—Definition.

(Mo. App.) A paving contractor does paving work in front of premises against which a paving tax bill is issued, where he paves only the lonigtudinal half of the street opposite the side on which premises are situated.—Municipal Securities Corp. v. Metropolitan Street Ry Co., 196 S. W. 400.

Liability of Street Railway for Paving Benefits.

(Mo. App.) Premises of a street railroad in front of which the company has, under the requirements of its franchise, paved a street, are liable for a paving tax bill issued against them where they are included within proceedings to pave street.—Municipal Securities Corp. v. Metropoltan Street Ry. Co., 196 S. W. 400.

Assessing Telephone Exchange.

(S. J. Sup.) A telephone exchange, not being in a legal sense permanently devoted to a public use, may be assessed for local improvments on the basis of the enhancement of its market value.—New York Telephone Co. v. City of Newark, 101 A. 391.

Power to Grade Streets—Liability for "Borrowing" Soil.

(Ga. App.) Where authorities of a city are clothed with power to grade its streets and without authority take soil from the property of a private citizen, the city is liable for the trespass.—City of Atlanta v. Swiney, 93 S. E. 24.

Nuisance in Sewage Plant—Liability of City—Careless Operation.

(Tex. Civ. App.) Municipality is liable for its torts or creation of nuisance in construction and operation of its sewage disposal plant, whether or not careless or negligent in such construction or maintenance.—Brewster v. City of Forney, 196 S. W. 636.

Right to Occupy Street—Public Necessity.

(Neb.) Right of private party to occupy part of a public street in front of his place of business must yield to public necessity or convenience, which question is ordinarily for the municipality's governing body, which cannot, arbitrarily deny such privilege.—Kenney v. Village of Dorchester, 163 N. W. 762.

License to Use Streets—Will of Council.

(Ill.) A city council may, in its discretion, grant a license for the occupation of the streets without qualification, or may impose such conditions upon the giving of its consent to any particular company as it deems advisable.—City of Springfield v. Interstate Independent Telephone & Telegraph Co., 116 N. E. 631.

Portland and Standard Cement—Extra Payments.

(N. Y. Sup.) Where specifications called for one part standard cement and two parts sand, or one part Portland cement and three parts sand, and contractor made no objection to changing from standard to Portland, he was not entitled to damages for change.—Ryan v. City of New York, 166 N. Y. 575.

Maximum Speed—Speed in Crowded Places.

(Cal.) Ordinance fixing maximum speed at 20 miles an hour was not a license to go at that speed at all times and places.—Cook v. Miller, 166 P. 316.

Street Lights—Right to Furnish Light for Profit.

(N. Y. Sup.) The common council of Brooklyn by its right to contract with a corporation to furnish lights in the streets had no power to confer on the corporation the right to furnish light to abutting owners for profit.—People ex rel. Clements v. Williams, 166 N. Y. S. 560.

Shooting Gallery in Street—Right of City to Grant.

(Ga. App.) City of Augusta is powerless to grant carnival association right to erect in public street, and maintain thereon during carnival, shooting gallery, in which firearms are discharged, endangering persons lawfully on street.—City Council of City of Augusta v. Jackson, 93 S. E. 304.

Power of City to Grant Right to Obstruct Street.

(Ga. App.) In view of Civ. Code 1910, § 894, municipality cannot, without express legislative authority grant any person right to erect or maintain obstruction in public street.—City Council of City of Augusta v. Jackson, 93 S. E. 304.

Baltimore—Power of Council Over Streets.

(Md.) Mayor and City Council of Baltimore have full control over streets and highways of city, power to maintain and regulate use of streets being a trust for benefit of public conferred on city by charter.—Lee v. Leitch, 101 A. 716.

Lights in Streets—Improving Streets.

(N. Y. Sup.) Use of streets for erection of poles to carry wires for street lighting is a street and not a municipal purpose, and any use which improves or benefits the street as a highway is a proper street use.—People ex rel. Clements v. Williams, 166 N. Y. S. 560.

Closing Street—Private Easements.

(N. Y. Sup.) Closing thoroughfare, not accepted by city as street under Laws 1895, c. 1006, providing that street then ceases to be such for any purpose, etc., extinguishes private easements arising from grant.—In re Wallace Barnes, and Matthews Aves. in City of New York, 166 N. Y. S. 429.

Roadway Width—Abandonment of Roadway.

(Mo.) Where railroad and city agreed as to construction of subway where street intersecting railroad was 80 feet wide, and subway was built, roadway being narrowed to 21 feet, street thereafter at subway crossing was not limited to width of subway structure of 21 feet, in absence of showing of city's intention to abandon rest of roadway.—State ex rel. Missouri, K. & T. Ry. Co. v. Public Service Commission, 197 S. W. 56.

Lowest Bidder Award.

(N. J. Sup.) Where law requires award of contract to lowest responsible bidder, municipality cannot lawfully reject lowest bid on ground that bidder is not responsible, without giving hearing and finding against his responsibility upon proper facts.—Kelly v. Board of Chosen Freeholders of Essex County, 101 A. 422.

Bidding—When Required.

(N. Y. Sup.) Requirement of city charter for competitive bidding for work to be done or materials furnished does not apply to renting city offices.—Voelcker v. Schnell, 166 N. Y. S. 420.

Damages for Delay in Work—Fault of Delay.

(N. Y. Sup.) Contractor cannot have damages for delay in work caused by city through contemplated changes in specifications if he fails to show that there was delay or that whole of delay was caused through no act of his own.—Ryan v. City of New York, 166 N. Y. S. 575.

Waiver of Delay—Responsibility.

(Wash.) Payment was not a waiver of a contractor's delay, in constructing public improvements, where it was not made until after he had agreed that employer should not be responsible therefor.—Droppelman v. Port of Seattle, 166 P. 248.

Payment for Rock—Decision of Engineer.

(U. S. C. C. A.) Engineer's decision that contractor was not entitled to payment for removing rock which fell into excavation from outside line to which payment was to be made held conclusive against contractor.—Barker v. City of New York, 242 F. 350.

Orders of Engineer—Payment to Contractor.

(N. Y. Sup.) Where engineer on public improvement ordered installation of certain sheeting not called for by the contract, the contractor could recover from the city the value thereof.—Ryan v. City of New York, 166 N. Y. S. 575.

Appropriation for Parks—Use.

(N. Y. Sup.) A city's appropriation for repairing and constructing parks, parkways, playgrounds, boulevards, and driveways does not authorize an expenditure therefrom for constructing a greenhouse in a city park.—Spencer v. City of New York, 166 N. Y. S. 177.

Interruption by Protest—Paving.

(Kan.) Where lawful paving of street is interrupted by insufficient protest and proposed ordinance initiated under G. S. 1915, § 1861, to pave block in question and two others, which was defeated, it did not prevent paving as originally undertaken.—Fairchild v. City of Holton, 166 P. 503.

Construing Grants and Franchises.

(Mo.) Grants of franchises and special privileges are always to be construed most strongly against donee and in favor of public.—Memphis Electric Light, Heat & Power Co. v. City of Memphis, 196 S. W. 1113.

Police Power—Erecting One-Story Buildings.

(S. D.) City has no statutory authority to pass ordinance prohibiting erection of one-story buildings in certain parts of its territory.—City of Mobridge v. Brown, 164 N. W. 94.

Police Power—Inspection Laws.

(La.) The object of municipal inspection laws is to protect a community from fraud and imposition, and right to pass such laws, not having been granted to Congress, remains as incident of "police power."—State v. Overby, 76 So. 220.

Special Assessment—Benefit to Property.

(Minn.) Where it was not shown that the city council made a demonstrable mistake of fact or applied an erroneous rule of law, its imposition of an assessment for a local improvement is not open to attack on the ground that the property was not benefited by the improvement.—In re Front Street Sewer Assessment, 163 N. W. 978.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

Jan. 21-23. — MONTANA INSTITUTE OF MUNICIPAL ENGINEERS. Annual convention, Bozeman, Mont. Secretary-treasurer, Roy F. Malsor.

Jan. 22-24.—AMERICAN WOOD PRESERVERS' ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, F. J. Angier, B & O. Railroad, Mt. Royal Sta., Baltimore, Md.

Feb. 4.—OREGON SOCIETY OF ENGINEERS. Annual meeting, Portland, Ore. Secretary, Orrin S. Stanley.

Feb. 4-7.—AMERICAN ROAD BUILDERS' ASSOCIATION. Fifteenth annual convention, Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 20.—CAROLINA ASSOCIATION OF HIGHWAY ENGINEERS. First meeting, Chapel Hill, N. C. Secretary, N. S. Mullican, county highway engineer, Lexington, N. C.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Association of Engineers.

The American Association of Engineers has instituted a plan of having one or more addresses at each meeting on engineering and industrial problems that relate to the demands and requirements of the nation in the existing war crisis. At the regular meeting of the Chicago Chapter, on January 4, an address on "Patriotism and Production" was delivered by John W. O'Leary, president of Chicago Association of Commerce. Samuel L. Greeley, consulting hydraulic and sanitary engineer, followed with an address on "Housing the National Army," in which he gave an outline of how sixteen new cantonments were constructed in 130 working days. T. B. Lambert, chief electrical engineer of Chicago Telephone Company, was elected president of the Chicago Chapter. Others were elected to office as follows: Paul Augustinus, chief engineer and vice president of Marquette Electric Company, first vice president; Ferdinand Oudin, chief engineer of Addressograph Company, second vice president; Robert W. Shelmire, designing engineer for Robins Conveying Belt Company, secretary; L. O. Wolf, assistant engineer Illinois Central Railroad, treasurer.

The New York Chapter of the American Association of Engineers met Jan. 15, 8 p. m., at the Hotel McAlpin. Edmund F. Perkins, consulting engineer, Chicago, president of the association, addressed the meeting on "National Association Science for Engineers."

National Association of Public Utility Land Appraisers.

The National Association of Public Utility Land Appraisers has been organized at a meeting held in the Southern Pacific building, San Francisco, Cal.

Specialists in land valuations, railroad and other public utility appraisement, from San Diego, Los Angeles, Salt Lake City, Portland, Oakland and San Francisco attended the meeting. They are connected with railways, gas and electric companies, water and power concerns and real estate firms.

Officers as follows were elected to serve for the ensuing year: Paul I. Welles, president; E. B. Henley, vice-president; B. C. Dickenson and Philip P. Paschel, members of board of direction; Herbert E. Stone, secretary.

The office of the secretary will be in room 1064, 65 Market street, San Francisco.

The Western Society of Engineers.

The following have been elected new officers of the Western Society of Engineers: Charles B. Burdick, president; James N. Hatch, Kempster B. Miller and A. S. Baldwin, vice-presidents; Carlton P. Dart, treasurer; trustee for three years, Wilford W. De Berard.

Northwestern Society of Highway Engineers.

That road building should be continued as a war measure and should not be suspended was the consensus of opinion expressed by the members of the Northwestern Society of Highway Engineers at their convention, held at Salem, Ore., December 15. A large number of county and state highway officials from Oregon and Washington and several members of the Washington highway department were present.

Among the papers read were two by city engineer O. Laurgaard of Portland, Ore., and H. B. Chapman, superintendent of maintenance for Multomah county.

The convention passed three resolutions. The first was that, as a war need, the development of roads was a necessity and should not be curtailed. The second favored the program outlined by the state highway commission for next year and classified macadam as a hard surface pavement whe scientifically constructed. The thir resolution favored the plan of th Pacific Coast Defense League in constructing a military highway extendin the entire length of the Pacific Coast

City Managers' Association.

Harrison G. Otis, city manager of Beaufort, S. C., elected secretary and treasurer of the City Managers' Association at the November Detroit convention, has announced a number of interesting new departures in the coming city managers' year book. This will take the place of the former publication of the association which has hitherto been limited to the proceedings of the annual conventions. The new year book will contain, in addition to the proceedings of the fourth annual convention, "achievement reports" from all over the country reviewing what the managers are actually accomplishing. The volume will be illustrated by charts and half tones of nearly one hundred city managers. A complete list of all cities claiming some form of city manager government, together with name and salary of the manager, is being compiled. It is hoped that the volume will be ready for distribution within a few weeks. A nominal charge will be made for the book.

Oregon Society of Engineers.

A new activity of the Oregon Society of Engineers is the institution of a series of courses in engineering mathematics, thermics and structural engineering, to be given in association with the extension department of the Oregon Agricultural College. These courses are designed to lead to higher degrees in the college.

Feb. 4 has been chosen as the date for the annual meeting, to be held in Portland.

Montana Institute of Municipal Engineers.

The annual meeting of the Montana Institute of Municipal Engineers is to be held Jan. 21 to 23 at Bozeman.

The meeting will be in the form of reports of committees of the society followed by discussions. The committees include: "Street Cleaning and Garbage Disposal," W. B. Vestal, chairman; "Sewers and Sewage Disposal," Geo. E. Baker, vice-chairman; "Standardization of Specifications," L. D. Conkling, chairman; "Highways and Pavements," L. D. Conkling and M. L. Morris, chairman; "Water Systems and Purification Plants," A. C. Birkland, chairman.

A banquet and a visit to the Montana State College will be features of the convention.

The officers of the institute are as follows: President, Carl C. Widener; vice-president, Andrew C. Birkland; secretary-treasurer, Roy E. Melsor. The directors include the officers and M. L. Morris and F. C. Snow.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

SELLAR GRAVEL WASHER.

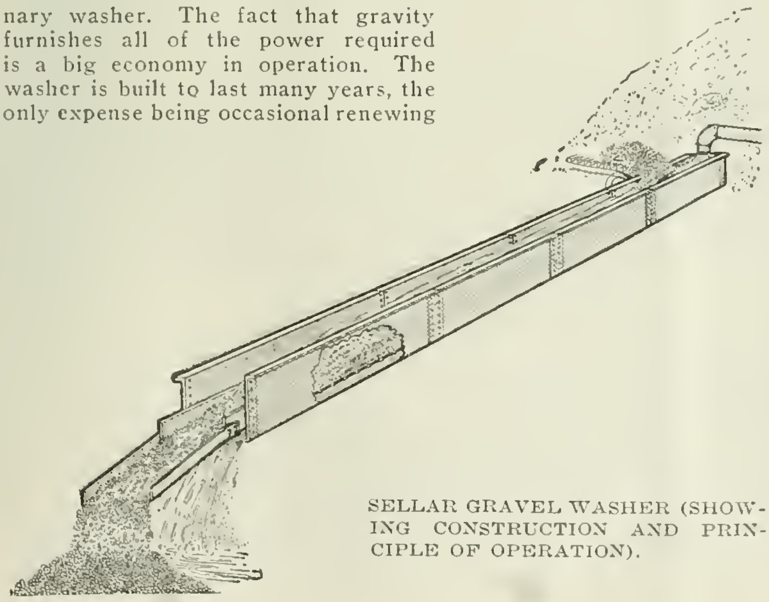
Designed for Low Cost and Economical Operation.

The Sellar gravel washer is a small outfit designed for portability and quick set-up. The first cost is low and the operation is economical. It can be rapidly taken to any gravel source and is especially adapted for use by contractors, county highway officials and city departments.

The Sellar gravel washer consists essentially of strong and rigid steel flume fitted with the Johnson patent perforated metal gravel screen designed to eliminate the possibility of clogging. The flume is set at a slant of about one inch fall per foot, depending on the water supply available. The gravel is put in by conveyor or otherwise at the high end of the flume just below the water supply and is washed down the flume by the volume of water. The sand and dirt is caught by slots and depressions and falls down the screen and is washed out by the flow of water. The gravel is rolled, scoured and washed clean and is discharged into conveyor, sizing screens or other ordinary means of handling it. With the standard screen, all gravel larger than 1/16-inch is cleaned and delivered to the conveyor. The washer is all steel and has no movable parts to break, wear out or give trouble. It is made in standard units 8 feet in length and is easy to move from one place to another as conditions at the gravel pit demand. The user can wash his gravel right on the job and save a great deal of teaming and expense.

The initial cost of the Sellar gravel washer is much less than for the ordinary washer. The fact that gravity furnishes all of the power required is a big economy in operation. The washer is built to last many years, the only expense being occasional renewing of the screens when they wear out. With a water supply of about 400 gals. per minute it is claimed that 100 yards of gravel per day can be washed with one single unit. If a larger output is required, additional units are installed to get the output desired.

The accompanying illustration shows a diagram of the washer. It is made by the Sellar Supply Company, 557-559 West Quincy street, Chicago, Ill.



SELLAR GRAVEL WASHER (SHOWING CONSTRUCTION AND PRINCIPLE OF OPERATION).

WARNING SIGNS.

For Safety and Protection Work.

The accompanying illustration shows a sign developed covering the recent government promulgation regarding the control of explosives. The government act requires "that every person authorized under this act to manufacture or store explosives or ingredients, shall clearly mark and define the premises on which his plant or magazine may be and shall conspicuously display thereon the words 'Explosives—Keep Off.'" This design combines the universal danger sign and the required warning. It has been approved by J. S. Peabody, director of explosives regulation. It is made in two sizes: No. 186, 10x14 inch and No. 206-A, 14x20 inches. The larger sign may be had of 30 or 18-gauge steel. The 18-gauge steel, fire-fused, porcelain enamel sign is recommended by the makers of durability and permanence. The 30-gauge sign is in baked varnish finish.

A number of other signs are made for similar purposes. A sign marking magazines are required in several states and for this purpose No. 919 is provided. It is lettered "Magazine—Explosives—Dangerous," in 6-inch letters, on a 21x24 inch sign, 18 gauge steel, porcelain enamel finish. Another useful sign is "Danger—No Smoking, Matches or Open Lights." This can be had in English and in sixteen other languages, all on one sign.

These signs are made by the Stonehouse Steel Sign Co., 17th and Lawrence sts., Denver, Colo. It also produces warning signs for all kinds of hazards, including safety signs, directing signs, safety bulletins and tags in a number of attention-compelling designs.

STONEHOUSE SIGN FOR EXPLOSIVES HAZARD WARNING.

INDUSTRIAL NEWS

Cast Iron Pipe.—Prices remain constant after the recent price-fixing by the government. Madison, Wis., has placed an order for 200 tons universal pipe with the Central Foundry Co. In New York the number of lettings appear to be increasing. Quotations: Chicago, 4-inch, class B and heavier, $57.35; 6-inch, $54.35. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49.

The Ransome-Leach Company, 115 Broadway, New York, N. Y., announces that Frank L. Brown, who was one of the directors of the Panama-Pacific International Exposition and for many years a leading business man in San Francisco, died suddenly of heart failure in New York, Jan. 1st. Mr. Brown's business life in San Francisco began in 1894, when he came from Portland to take charge of the Washburn-Moen Company. He was instrumental in the consolidation of that concern with the American Steel and Wire Company, of which he was for a time head, before its amalgamation with the United States Steel Corporation. He organized the Pacific Steel and Wire Company, and, with his associates, organized the Great Western Power Company. Immediately after the exposition closed, Mr. Brown went to New York to become president of the Ransome Concrete Machinery Company. Mr. Brown was a member of the Bohemian, Union League and Commercial clubs of San Francisco and of the Rotary and Rocky Mountain clubs of New York. He was vice-president of the American Exporters' and Manufacturers' Association, and a member of the National Association of Mixer Manufacturers and the National Association of Manufacturers. Mr. Brown was born in Kenosha, Wis., March 4, 1859.

The Chain Belt Company, Milwaukee, Wis., with extreme regret, announces the death of Christopher W. Levalley, founder and chairman of the board of directors of the company, of heart failure suddenly at his home in Milwaukee on Friday, January 4th. Mr. Levalley was born at Manchester, Conn., in April, 1835. After serving in the civil war he became superintendent of the St. Paul Harvester Company, later becoming general manager. It was at this time that he saw the necessity of a positive drive for harvesting machinery and in 1891 he came to Milwaukee, where he established the Chain Belt Company. In 1907, Mr. Levalley conceived the idea of driving a concrete mixer with a steel chain and using a cast semi-steel drum. These ideas were incorporated in what was known then as the Chain Belt mixer, but which name has since been changed to Rex mixer. Mr. Levalley was president and general manager of the Chain Belt Company from 1891 until 1916. In 1916 he was elected chairman of the board of directors. He was also interested in the C. O. Bartlett & Snow Company of Cleveland and The Federal Malleable Company of Milwaukee. Mr. Levalley was a donor of a great many gifts to charitable institutions and only within the past year gave $100,000 to Milwaukee Foundation.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., has issued for general distribution the "Holiday 1917 Edition" of its Bulletin, No. 230. It lists a very attractive offering in all kinds of construction equipment and supplies, including cars, cranes, steam shovels, tanks, steel piling, compressors, hoists, boilers, buckets, concrete mixers, concrete forms, crushers, derricks, drag lines, drills, dryers, engines, generators, etc.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

A SEWER SYSTEM is to be constructed by Clarksville, Ia. Plans for the improvement have been completed by the engineer, G. H. Bishop.

A WATERWORKS SYSTEM is to be built by Garnett, Kans. Preliminary plans are being prepared by the consulting engineers, Black & Veatch.

Tama and Marshall counties, Ia., are to make extensive DRAINAGE IMPROVEMENTS. The engineers for the work are the Ingersoll-Stoufer Engineering Co.

North Plainfield, Plainfield and Dunnellen, N. J., are to construct a joint SEWAGE DISPOSAL PLANT. The municipalities have retained Geo. W. Fuller as engineer.

A SEWER SYSTEM and SEWAGE DISPOSAL PLANT are to be built by Janesville, Minn. The village has retained as consulting engineer on the work Frederick Bass.

Summit county, Akron, O., is to construct a VIADUCT to cost about $1,200,000. The city has retained as consulting engineers the firm of Harrington, Howard & Ash.

Springfield, O., is confronted with the problem of developing a new WATER SOURCE and purifying the supply. The city has retained the engineering firm of Hazen, Whipple and Fuller to investigate and report on possible solutions.

PAVING IMPROVEMENTS are to be made by Miller, Ind. The engineer for the work is Wm. J. Fulton.

The town of Granville, Wis., is to make DRAINAGE IMPROVEMENTS according to plans by H. C. Webster.

Elmhurst, Ill., is to improve its WATERWORKS SYSTEM. Plans and specifications were prepared by the engineer, H. L. Emerson.

Kansas City, Mo., is to build an ELECTRIC LIGHT PLANT to cost about $700,000. The consulting engineers retained by the city are the firm of Burns & McDonnell.

A WATER SUPPLY SYSTEM to cost about $55,000 is to be built by Williams, Ariz. Plans for the work are being prepared by the engineering firm of Olmsted & Gillelen.

Northampton County, Bethlehem, Pa., is to construct a BRIDGE to cost about $1,000,000. Plans and specifications for the structure have been completed by the engineer, C. W. Hudson.

The Fort Smith Light and Traction company and the Southwestern General Gas company, have announced an increase in natural gas RATES. In order to determine the reasonableness of the increase, the city of Fort Smith, Ark., has retained G. S. Gilbertson, of the accounting firm of Baker, Vawter & Wolff to examine the books of the utilities.

PERSONALS

Allen, James, state highway commissioner of Washington, has been appointed to succeed himself for the next four years.

Anstiss, William E., has resigned as chief of police of Laporte, Ind., to become assistant state fire marshal.

Brown, William D., veteran chief of police and for a number of years head of the fire department of San Jose, Cal., died recently as the result of a fall from a window in a local sanitarium.

Campbell, H. R., statistician of the Pennsylvania state highway department, has resigned on account of ill health.

Canavan, Thomas J., commissioner of public works and president of the board of local improvements, East St. Louis, Ill., has resigned.

Cashin, Thomas A., superintendent of the municipal railways of San Francisco, Cal., since their inauguration in 1912, died recently of heart disease at the age of 39.

Craig, Robert, A., has resigned as city manager of Phoenix, Ariz., to accept a similar position in Santa Barbara, Cal. V. A. Thompson has been named to succeed him in Phoenix.

Dowty, William, has resigned as fire chief of Hamilton, O.

Fairtrace, George D., acting city engineer, has been appointed city engineer to succeed captain Hal Moseley, now in the Engineers' Reserve Corps.

Lewis, John G., new socialist mayor of Elwood, Ind., has appointed Max Hughes chief of police, probably the only socialist now holding such a position in the state.

McDonough, John F., chief of police of Marion, Ind., for the past ten years, died recently at the age of 48.

Mahoney, Jeremiah, of the veteran contracting firm of Mahoney Bros., San Francisco, Cal., died recently at the age of 82.

Rightor, Charles E., has completed the winding up of the affairs of the Dayton, O., Bureau of Municipal Research, which will be temporarily discontinued. Mr. Rightor has become identified with the federal bureau of efficiency.

Sapp, Lem, is now fire chief of Defiance, O., succeeding Louis Spring, resigned.

Shilling, Charles F., former mayor of Decatur, Ill., died recently at the age of 60.

Walden, Chas. B., fire chief of Wichita, Kansas, since 1886, died recently at the age of 70.

Warren, Joel F., has been appointed chief of police of Seattle, Wash., to succeed Charles L. Beckingham.

Waters, George W., is now mayor of Laurel, Md., and commissioner of Prince Georges County.

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IMPROVING SANITARY CONDITIONS AT LEAVENWORTH

Control of Health Activities in the Extra-Cantonment Zone Around Fort Leavenworth, Kansas, by the U. S. Public Health Service—Apparent Inadequacy of Water Purification Plant.

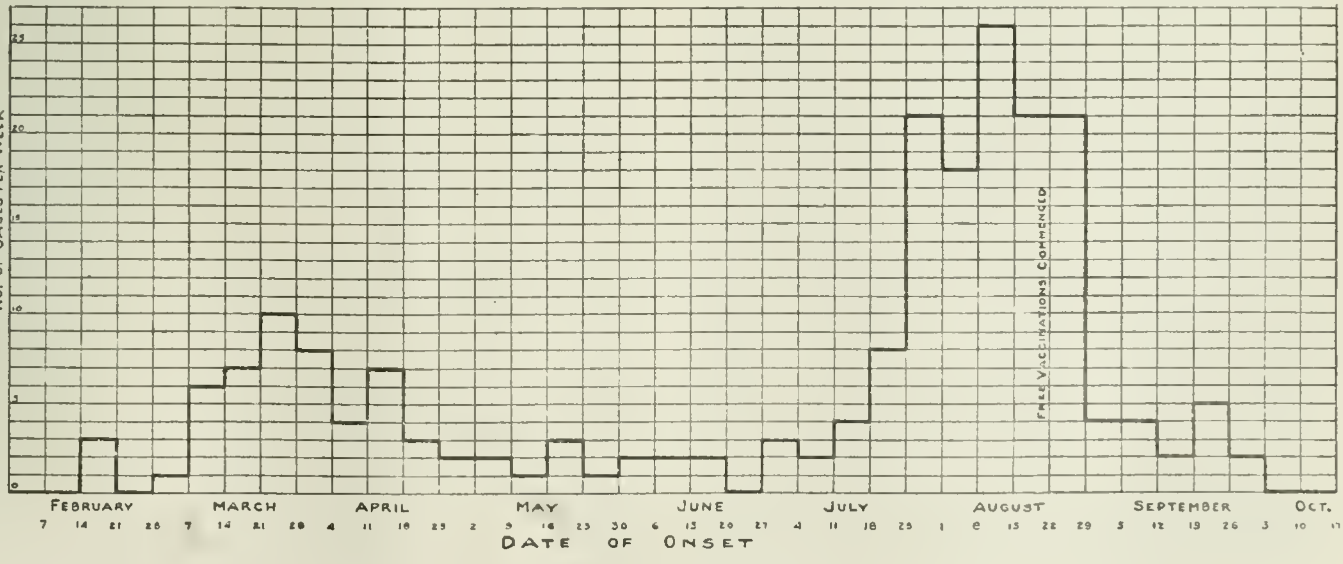
By J. G. WILSON* and H. B. HOMMON.†

The city of Leavenworth, Kansas, is one of the larger communities situated near a large army camp where the health conditions were such as to demand the attention of the U. S. Public Health Service in order to protect the health of the officers and soldiers and the relatives and friends visiting them, and the civilian population working at the government institutions.

Leavenworth is situated along the west bank of the Missouri river and has a population of approximately 20,000. Adjacent to the city on the north is the government reservation on which are located Fort Leavenworth, the Disciplinary Barracks, and the Federal prison. The National Soldiers' Home lies to the south just beyond the city limits. The number of officers and enlisted men at the fort varies, but it is anticipated that there will soon be approximately 10,000 men there, and in addition there are about 1,500 at the Disciplinary Barracks. At the Federal Prison there are 1,600 men and at the Soldiers' Home approximately 2,000 inmates during the summer and 2,600 during the winter. The total population in and adjacent to Leavenworth is at the present time, or soon will be, approximately 35,000.

On February 14th, 1917, one case of typhoid fever was reported in the city of Leavenworth, and from this time on the number of cases reported varied, always one or more cases developing each week, until the week ending August 1st, when 21 new cases developed. It was evident by this time that the epidemic was getting beyond control and the surgeon general of the U. S. Public Health Service was appealed to for assistance. Assistant surgeon J. G. Wilson, one of the writers of this paper, was ordered to Leavenworth on August 14th to study the situation, and assistant surgeon C. V. Aiken was ordered to proceed to Leavenworth with the interstate quarantine laboratory car "Wyman" on August 20th. Upon arrival at Leavenworth on August 16th, Dr. Wilson found that 26 cases of typhoid fever were reported for the week ending the 15th and that the situation demanded immediate and energetic attention. He was made City Health Officer without compensation on the 16th, and when the interstate laboratory car arrived, analyses of water from the city supply and the wells were made at once to learn whether the infection was contained in the city water.

The city water supply is obtained from the Missouri river about one mile above the city and above all the sewer outlets from the city, but only about one mile below the outlet from a septic tank receiving the sewage from 1,600 prisoners at the Disciplinary Barracks at the Fort. The raw water pumped from the river is treated with alum at a rate varying from 3 to 6 grains per gallon, depending upon the turbidity of the water, and allowed to settle in a primary settling basin about 1½ days and then again treated with alum at the rate of 3 to 6 grains per gallon and allowed to settle for approximately 1½



TYPHOID FEVER CASES IN LEAVENWORTH, KANSAS, FEBRUARY 1 TO OCTOBER 17, 1917.

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*Assistant Surgeon, U. S. Public Health Service.
†Sanitary Engineer, U. S. Public Health Service.

days in two secondary basins. The water from the final settling basin is treated with liquid chlorine at a rate of approximately 0.44 p. p. m. The storage capacity is computed from the volume of the settling basins, and as operated, the actual detention period is probably much less than one-half the computed value.

The apparatus for applying the alum is very crude, there is only one chlorine gas machine, the emergency hypochlorite tanks are unserviceable, and there are no baffles in the settling basins to insure either a thorough mixing of the alum solution with the water, or a storage period comparable with the capacity of the basins. In fact one of the secondary basins has the inlet in the west wall near the middle and the outlet in the south wall near the west wall. Mud was allowed to accumulate in the primary basin until practically one-half of its capacity was not available. The alum devices consisted of cylinders that were charged with alum each hour and city water under pressure passed through the alum and into the water to be treated.

Dr. John J. Sippy, epidemiologist for the State Board of Health, had made a report on the typhoid fever situation in July in which it was stated that the milk supply was eliminated as the original source of infection and that the epidemic was probably started during the February flood stages of the river by insufficiently chlorinated water supplied by the City of Leavenworth & Ft. Leavenworth Water Co. The analyses made by assistant surgeon C. V. Aiken in the interstate laboratory car the latter part of August indicated that the city water supply was satisfactory at that time, but the physical condition of the plant was such as to arouse suspicion of its ability to produce pure water continuously. A report on the water situation, covering a few days' observation, had been made in August by sanitary engineer H. W. Streeter, U. S. Public Health Service, in which it was pointed out that, notwithstanding the fact that much favorable evidence was at hand regarding the quality of water furnished the city of Leavenworth, the equipment for treating the water at the pumping station seemed inadequate for the purpose, and before final judgment could be passed on the city water supply a daily examination should be made covering at least two months. The evidence referred to comprised the reports of the State Board of Health and the Kansas City Testing Laboratory, containing weekly analyses as far back as January 1, 1917, and a special report by Waldin Williams, chemist and bacteriologist for Kansas City, Kansas, containing daily analyses for August 9th to 28th, inclusive.

In the State Board of Health report, five samples were found in the weekly analyses from January 2d to October 22d that contained B. coli in at least one of the five 1-cc. samples analyzed. Over this period ten samples were reported as containing B. coli in the one 10-cc. portion analyzed in each sample submitted. The Kansas City Testing Laboratory only tested for B. coli in 1-cc. portions and they did not report the presence of B. coli in any of the samples from January 4th to August 25th. In Mr. Williams' report covering the period from August 9th to 28th inclusive, B. coli were indicated present in the 10-cc. portion tested in only one of the duplicate samples taken on three different days. No positive tests for B. coli were reported in any of the 1-cc. or 0.1-cc. portions analyzed.

The total number of bacteria per cc. determined on agar at 37°C. was below 100 in all the reports except on one or two occasions.

It should be stated, in considering the bacteriological evidence relating to the water, that at the Federal prison with a population of 1,600 men using the city water there was not one case of typhoid fever reported, although 75 per cent of the men were said to be within the susceptible age.

In view of the conflicting evidence regarding the purity of the city water and the fact that the equipment at the pumping station did not seem adequate for guaranteeing a bacterially pure water at all times, it seemed advisable to make a comprehensive study of the water supply, and H. B. Hommon, sanitary engineer, U. S. Public Health Service (one of the writers of this article) was detailed for this study.

If the evidence was not positive as to the *cause* of the typhoid fever epidemic, there was no reason for doubting the means by which it was being perpetuated. Wells of the open type were common all over the city; privy vaults, without protection from flies, and from which the liquids had all leaked out into the soil, were more common than open wells; open manure boxes were found in all the alleys; there was no effective ordinance controlling the production and distribution of the milk; and the handling of food products in general was unsatisfactory.

The organization of the health department consisted of a local doctor giving part time to the work, and one sanitary inspector. When the U. S. Public Health Service took over the city health office a campaign was started at once to raise sufficient funds to provide means of stopping the epidemic immediately and to make a survey of the sanitary conditions of the city. The county and city of Leavenworth together contributed $5,000, the National Red Cross contributed $13,000, and the U. S. Public Health Service added $1,000 per month, all the money to be utilized at the discretion of the city health officer. In carrying out this work two main objects were kept in mind: first, to combat the present epidemic and to prevent the interstate spread of typhoid fever, and second, to clean up the city of Leavenworth and the towns in the county and effect a permanent health organization so as to promote the future health of the community and the soldiers at the Post.

The National Red Cross, through the Division of Sanitation of Extra-Cantonment Zones around Army Camps, sent three inspectors and three Red Cross nurses to assist the government in carrying out the program of stamping out typhoid fever in Leavenworth, and impressing upon the people of that city the necessity for maintaining an efficient health organization.

The first step taken to stop the typhoid fever epidemic was to vaccinate as many as possible of the residents over three years old and under 50. The vaccination was done free, and one week before the time set to begin, advertisements were placed in the local papers announcing the places where the vaccination would be given. The people responded in large numbers, and at the end of but a few days 5,000 had been vaccinated, the total number for the city being 5,266. In the rural districts 396 were vaccinated and at the State penitentiary and the Federal prison 565. The total number receiving the first dose was 6,227, there were 5,744 that came back for the second, and 5,277 received all three doses. The chart accompanying this article shows the number of cases per week from the beginning of the epidemic and also the date when free vaccination began. The time of onset is given for each case. It cannot be proven that the rapid falling off in the number of cases reported following the first vaccination was due to the vaccine, but the fact that only two new cases occurred in the city after October 3d to date (Dec. 18, 1917) is fairly good evidence that a high degree of immunity came from some source.

While the City Health Officer, assisted by local physicians and the Red Cross nurses, were vaccinating the people, the milk inspector was drafting an effective milk ordinance and the chief sanitary inspector of the Red Cross, assisted by local inspectors, was making a house-to-house canvass to gather information relating to sanitary conditions in the city.

The cards carried by the sanitary inspectors called for the following information: first, whether the occupants used city, well, or cistern water; second, whether a privy vault was used and if so the type and sanitary condition of it; third, from whom the milk supply was obtained; fourth, the number of people that had typhoid fever or other diseases during the year; fifth, the age of all the members of the household and occupation of the adults; sixth, other miscellaneous data that would be valuable in forming an opinion as to the best health measures to adopt for preventing future epidemics of any kind.

The milk ordinance passed by the Board of Commissioners, after considerable opposition, required that the milk inspector visit all the dairies and issue permits to the owners when their equipment and method of handling the milk was pronounced satisfactory. It required that all cows be given the tuberculin test, it contained rigid requirements regarding the production and distribution of the milk, and the total bacterial count in the milk was not to exceed 300,000 per cc. The opposition that developed when the ordinance was first introduced gradually disappeared and in the end the dairymen were cooperating with the health department. In the average herd 2 to 3 per cent of the cows reacted to the tuberculin test, but in one herd 6 out of the 13 cattle gave a very decided reaction.* When cattle give a positive reaction, the state law requires that they be appraised by a representative of the state and the owner and a third party selected by the first two, and the owner given one-half the appraised value. The state then ships the cattle to a packing house where there is a government inspector, and if the meat is not dangerously affected the cattle are sold for beef, the state receiving the money.

An ordinance relating to the construction and attention of privy vaults and sewer connections was passed. This ordinance specified the size of the vaults and required them to be water-tight and enclosed by a building in such manner as to prevent the access of flies, chickens, or small animals of any kind. It further provided that no privy vaults would be permitted where there were city water and sanitary sewers available in the streets or alleys. The total number of privy vaults in the city has not been tabulated, but up to December 15th there were 1,884 houses where notices to make sewer connections or construct new vaults were served. Considering that the city is not well supplied with either city water or sanitary sewers, the number of privy vaults where no sewer connections can be made will probably be more than 2,000. Some objections have been encountered in carrying out the provisions of this ordinance, but on the whole the conditions are being met within the time limit specified in the ordinance.

A laboratory was equipped out of the funds appropriated by the city and placed in charge of a bacteriologist from the Red Cross Unit. Daily analyses of the city water were made, a large number of wells were examined, and after September 4th the stools of typhoid fever patients were examined to decide when they ceased to be carriers. Also swab specimens from suspected diphtheria patients were examined at the laboratory and other miscellaneous work done to assist in the diagnosis of various diseases.

Approximately 100 wells were examined and of this number 75 per cent were badly contaminated. This was to be expected from the large number of poorly constructed privy vaults all over the city, and as this ratio would undoubtedly hold for the entire city, the well water was considered unsatisfactory as a whole and all families using wells or cisterns were continually advised through the local press to boil all the water drawn for drinking purposes, or any purpose whereby water from these sources would be taken into the system. The city water mains were not extended over a large enough area of the city to warrant the closing of all the contaminated wells.

The bacteriological results obtained from a daily examination of the city water during September and October indicated that the water on the average comes within the standard set by the Treasury Department for interstate carriers. There were times, however, during the period when daily tests were made, that the total count was as high as 800 bacteria per cc., and B. coli were found in more than one of the five 10-cc. portions tested. The poor results came at the time when a part of the settling basins was out of service for removing mud, and these results bore out the contention, referred to earlier in this paper, that the treatment plant is not adequate and is not operated so as to give a satisfactory water under all conditions of plant operation. The turbidity of the water furnished the city was never less than 10 p. p. m. during the period of the tests and often ran as high as 35 in normal operation and as high as 50 p. p. m. when a part of the settling basins was out of operation. The emergency recommendations made on the basis of the bacteriological results obtained, and the examination of the physical properties of the plant, were:

First.—An emergency liquid chlorine or hypochlorite apparatus should be installed and maintained in good working order to supplement the liquid chlorine machine now in use.

Second.—A modern apparatus in duplicate should be installed to regulate the amount of alum added to the water at each of the two points of application.

Third.—The amount of water pumped daily should be determined either by installing a meter or by rating the pumps by the amount of water drawn down in the secondary basins when the inlet to these basins is closed. This is necessary to regulate the alum and chlorine treatment.

Fourth.—Baffles should be arranged in front of the inlet to the first secondary basin to cause a thorough mixing of the alum with the water entering the basins.

Fifth.—The mud in the primary basin should be removed at once. Practically one-half the effective settling capacity is now filled with mud.

Sixth.—All the mud in the first secondary basin should be removed.

Seventh.—The reserve storage reservoir at Pilot Knob should be emptied and thoroughly cleaned.

Eighth.—A barbed or woven wire fence at least eight feet high should enclose Pilot Knob storage reservoir, with a fine-mesh chicken-wire fence, three feet high, around the bottom. The gate to this reservoir should be kept locked. The ground inside the fence should be seeded down with grass, the weeds cut, and a competent watchman engaged to guard the reservoir.

Ninth.—The laboratory at the office of the Water Company should be fully equipped for bacteriological work and the man in charge given ample opportunity to study and develop a routine procedure for making daily tests of the raw and treated water. He should also be given complete charge of the operation of the treatment plant.

Tenth.—The treatment plant should receive more attention, and when basins are taken out of service for removing the mud, etc., work should be carried on vigorously and without interruption until finished.

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*775 cattle were tested; 23 were found to be tuberculous.

In view of the fact that the city has not been able to obtain adequate service from the water company, and that the emergency measures necessary to be made at once will cost considerable money, and that sand filtration will eventually be required, it was advised that the city initiate a movement at once to purchase the water plant and remodel it into a modern filtration plant. The water company is now filtering the water furnished the government for Fort Leavenworth except the Federal prison, and records of the Post laboratory show that the filtered water is of a high quality at all times.

The cause of the typhoid epidemic in Leavenworth can only be arrived at by the process of elimination, and even this method has its weak link. The outbreak occurred in February during flood stages of the river and at a time when typhoid fever existed in the cities and towns located on the river above Leavenworth. The treatment plant of the City of Leavenworth and Fort Leavenworth Water Company was found during September and October to have lapses in efficiency when large numbers of bacteria and B. coli were found in samples drawn from the city mains. This alone would be sufficient evidence to place the blame for the epidemic on the city water if it were not for the fact that at the Federal prison, where city water was used, there was not one case of typhoid reported among the 1,600 prisoners, 75 per cent of whom were within the susceptible age.

City water was, however, the only product of human consumption that was used by all the patients during the early stages of the epidemic, and knowing the type of treatment plant and the method of operation, all the evidence, except that noted above, points toward the city water as the original source of infection. While the samples analyzed during February, March and April did not indicate the water in the mains was contaminated to any great extent, it must be borne in mind that only weekly tests were made and that there was ample opportunity for insufficiently chlorinated water to get into the mains and be used up between the regular sampling dates. The epidemiological data eliminated all food products as the original source of infection as far as the first cases could be traced to any one source of supply of any one common food used by the patients during the early stages of the epidemic.

Summing up the situation at the extra-cantonment zone around Fort Leavenworth at the time when the U. S. Public Health Service took charge we have the following conditions existing at that time:

1. A serious typhoid fever epidemic was running at the rate of 26 new cases per week.

2. Poorly constructed and unprotected privy vaults were common all over the city.

3. Open manure boxes were in all the alleys.

4. Water from wells adjacent to the privy vaults was being used without boiling, all over the city.

5. The milk supply had no safeguards thrown about it and the sanitary conditions under which it was produced and distributed in many cases were very bad.

6. The purity of the city water supply, taken from the Missouri river, which is always badly contaminated, was under suspicion.

7. The health department consisted of a local physician giving part time, and one sanitary inspector. There was no laboratory for clinical diagnostic work and typhoid fever patients were released from quarantine whenever the temperature became normal.

8. Only a very small number of children and young people were vaccinated against smallpox. There were 15 cases of smallpox in October.

9. The sanitary conditions in many of the stores handling foodstuffs and selling refreshments were very unsatisfactory.

The records of the health department up to December 15th will show that very satisfactory progress has been made in improving the sanitary conditions that were found when the Government took charge on August 16th. Through inoculation, quarantine of patients, public lectures and warnings through the local papers to boil all water and milk, the typhoid fever epidemic was broken up in six weeks. City ordinances were passed controlling the production and distribution of milk, and an ordinance covering the construction and attention of privy vaults and sewer connections was passed and put into force. Regulations to prevent the breeding of flies in manure were included in an ordinance covering the construction of manure boxes. A laboratory was established and typhoid fever patients were not released from quarantine until the stools were free of typhoid bacilli. Out of 85 typhoid cases, 58 patients were carriers for 10 days after the temperature became normal, the others varying from 12 to 64 days. A threatened smallpox epidemic was stopped by promptly vaccinating 94 per cent of the children in school and a large number of older people. In all, 2,727 vaccinations against smallpox were given, up to December 1st. A complete sanitary survey of the city was made and data obtained for drafting the ordinances relating to the handling of food products and refreshments in stores, restaurants and hotels; privy vaults; sewer connections; and the storage of manure. A daily examination of the city water was made for a period covering three months and an examination of the treatment plant made and a report prepared recommending that improvements be made at once to guarantee the best results that can be obtained with the present treatment plant, and that sand filtration be provided in the near future. The State Board of Health has authority to require that the recommendations relating to the water supply are carried out.

The health program laid out by the representatives of the U. S. Public Health Service for Leavenworth is only what should be provided for every city, and it is hoped that when the present emergency has passed the city will maintain a full time health officer, a well-equipped laboratory and enforce the ordinances recently passed that have been found practical in operation during the last two and one-half months.

THE DAVENPORT SEWER INLET.

By ROSCOE E. SAWISTOWSKY.*

The general topography of Davenport, Iowa, is rather hilly, with steep slopes, and the sewer inlet problem here is to get the water as it comes pouring down the long hills, and get it fast. To meet this condition we use an inlet that we consider the most efficient and practical one that has been designed. The size of the grate is 24″ x 36″, with 3.20 square feet of openings. The cross bars are at an angle of 60 degrees from the horizontal, which greatly increases the capacity of the grate, that being the unique feature of this design. The weight of the grate in grey iron casting is 257 pounds and that of the frame is 210 pounds.

The bottom walls and back are easily constructed of concrete. We have built some entirely of brick, but find that the ones constructed of concrete are cleaner and more sightly, besides being cheaper in construction.

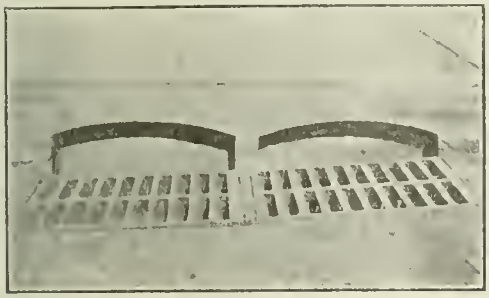
The arched recess or opening at back of grate is necessary to receive the coarser material washed to the inlet. Our streets are cleaned by flushing with automatic flushing wagons. One man follows the flusher with a stiff broom, pushing the heavier material along with the water to the basin and through this opening in the back of the curb.

---

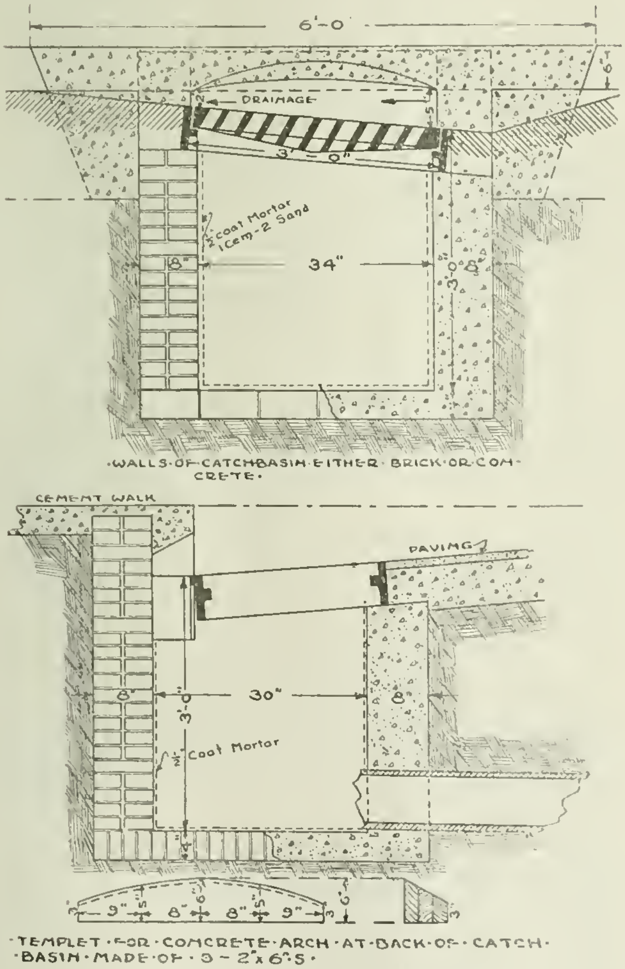
*City engineer of Davenport, Iowa.

We have had very little trouble with stoppage of inlets where the new ones have been installed, except in the autumn when the leaves from trees will stop up the openings in any grate, no matter what the design. When the grate is clogged with leaves, the water will flow through the opening in the back of the curb.

The cost of inlet, complete, is about $20 when built by city forces. This, of course, does not include the laying of pipe to the inlet from the main sewer, which will depend upon length of pipe and size necessary.



DOUBLE INLET.


6'-0
6"
DRAINAGE
2
5
3'-0"
½" coat Mortar 1 Cem-2 Sand
8"
34"
3'-0"
8"
·WALLS·OF·CATCHBASIN·EITHER·BRICK·OR·CONCRETE·
CEMENT WALK
PAVING
8"
30"
3'-0"
8"
½" Coat Mortar
4"
3"
9"
5"
8"
6"
8"
5"
9"
3"
6"
3"
·TEMPLET·FOR·CONCRETE·ARCH·AT·BACK·OF·CATCH·BASIN·MADE·OF·3 - 2"x6"S·

SECTIONS OF DAVENPORT INLET.
Drainage flows from right to left in the upper section.

MOTOR TRUCKS AS FREIGHT BOAT FEEDERS.

A demonstration of the possibility of cooperation between motor trucks and boat lines for the improvement of transportation facilities has been given in the territory adjacent to Long Island Sound, according to reports that have been received by the office of the chief of engineers of the War Department, and communicated to the Department of Commerce.

At New Haven, Conn., products are being received from interior points in that state by auto trucks which deliver goods at the dock of the Starin New Haven Line. Transportation is by water from that city to New York, and the following day the goods are loaded on a through car for their destination on the Lackawanna fast freight lines.

This new war-dispatch route eliminates the transfer car, and the use of car, engine, and floor space in freight house, and tends to consolidation and increased tonnage on the through car from New York to the destination. Among the places in Connecticut that are being put into direct communication with the Sound transportation facilities are Derby, Shelton, Ansonia, Seymour, Waterbury, New Britain, Meriden, Hartford, Middletown, and Wallingford.

REDUCING CONCRETE MIXER GANG.

A new wrinkle in delivering concrete material to the mixer, intended to meet an expected shortage of labor, was used last summer by the Independent Asphalt Paving Company, of Seattle, in the work of laying concrete pavement on three and one-half miles of the Pacific Highway. The company anticipated that the expansion of the shipbuilding industry in Olympia and vicinity and the construction of the American Lake cantonment would make labor very scarce, and set their wits to work to reduce their concrete gang to a minimum.

The company had a number of automobile trucks, and it had the bodies of each of four of these separated into five compartments by four wooden partitions. Each partition was made with the top half fixed and the lower half hung from the upper by strap hinges and held in place at the bottom by a simple catch which could be released easily. The trucks were of three-yard capacity and were self-dumping. The idea was to place in each one of the five compartments the proportions and quantites of sand and gravel required for a single batch. On reaching the mixer, the truck would be backed up to a position for discharging directly into the hopper of the mixer. The body would be raised for dumping and the tail-board released, when one batch of material would drop into the hopper. When this had been mixed, the bottom half of the first partition would be released and the material from the second compartment would be discharged into the hopper; and in succession the other three compartments would be similarly discharged.

The sand and gravel were received by rail at a point approximately in the center of the work. At this point a stiff-leg derrick with a three-quarter-yard clam-shell bucket was used to lift the material directly from the cars to stock piles containing approximately 3,000 cu. yds. of gravel and 2,000 cu. yds. of sand. (No paving was started until this amount of material was on hand, in order that the concreting might be continuous after it had once been started.) Meantime, a small loading bunker was built, designed to hold about 5 cu. yds. of sand and 10 cu. yds of gravel and equipped with 5 measuring boxes for sand and 5 for gravel so located in the bottom that they could all be discharged into the compartments of a truck-body without moving the truck. This bunker was filled by means of the stiff-leg derrick. The measuring boxes delivered into each compartment 6 cu. ft. of sand and 9 cu. ft. of gravel. Three sacks of cement were added to this at the mixer when the aggregate was dumped into the hopper.

Where the contractor had been in the habit of using twenty-two men on the mixer, he found that ten men did the work easily in connection with this plan of filling the hopper. In addition, no stone was lost by spilling onto the sub-grade and the concrete was entirely free of dirt shoveled up from the ground with the aggregate, which mixture of dirt is common when the wheel-barrow method is employed.

By actual timing it was found that each truck had to stand at the mixer an average of 9 or 10 minutes on each trip, or 25 per cent of the working time. A truck of this size can be rented for $2.50 an hour. Four trucks were used to keep the mixer going and each was delayed 2 hours a day at the mixer, giving a cost of $20 per day in delay of trucks by this method of filling the hopper. As labor cost $3.25 a day and 12 men were saved, the saving in labor was $40. In addition to this, there was a probable saving of material which would have been spilled onto the sub-grade. It was estimated that this method gave a net saving of about five cents a square yard in the cost of the paving.

RESPONSIBILITY FOR FIRES.

In an address at the annual convention of the Illinois State Firemen's Association early in January, H. P. Wood, ex-mayor of Joliet, urgently recommended that action which many would consider drastic be taken in an effort to reduce the fire loss in the United States. Mr. Wood while mayor so improved the fire-fighting facilities of Joliet that the city was able to obtain a material reduction in its insurance rates.

The first recommendation was that of placing responsibility for fires, both moral and legal. The French law assumes that some one is responsible for every fire that occurs and endeavors to place that responsibility, generally upon either the tenant or the landlord. The tenant is held responsible unless he can prove that the fire originated from some cause beyond his control. If he does so, then the onus of proof reverts to the landlord, and the landlord may perhaps in turn pass it on to the builder; or each of them may be held to a partial responsibility for failure to notice or report infractions of the law by the others. Practically the same idea is embodied in the German law and practice.

The idea has found partial adoption in some cities of the United States, Mr. Wood citing the case of the New York Fire Department vs. the Universal Film Manufacturing Co., in which the Appellate Court held the company responsible on two accounts, one for failure to obey the order of the fire marshal to install sprinklers, the other holding it responsible to the city for the cost of putting out the fire. In Wisconsin, the local fire marshal is given considerable power and also extensive duties, being required to make at least four inspections of every mercantile and manufacturing building before his department is entitled to its 2 per cent of the insurance premiums.

Mr. Wood stated that in Illinois 85 per cent of the fires occur from negligence and therefore 85 per cent of the insurance premiums are unnecessary and wasteful. He considers it necessary to change our psychology concerning fire losses, and instead of sympathizing with persons who have a fire on their property, we should condemn them as subjecting the entire community to a tax in the form of increased insurance premiums and expenditures for water supply and fire departments which are rendered necessary by such negligence on the part of themselves and others. "There is no remedy so potent and no law so educative as that which places the blame for the injury which others receive through one person's negligence or greed, and forces him to compensate those injured by his acts of omission or commission."

Another idea of modified psychology aims to place some of the responsibility for fires with the firemen! Instead of lauding the heroism of firemen who lose their lives, we should condemn the fire department as a whole for the existence of the conditions that made such loss of life possible. (This, we presume, applies only where the fire department is given complete authority to secure the carrying out of adequate building laws and other ordinances calculated to prevent fires.) "If 85 per cent of the fires are caused by negligence and are unnecessary, then obviously 85 per cent of the risk and liability to be injured which firemen undergo are unnecessary. Carrying the thought further, 85 per cent of the drain on your insurance fund is unnecessary. A United States soldier who unnecessarily exposes himself to injury or death is not complimented for bravery, he is court-martialed. It is not necessary that firemen should go on risking their lives putting out fires which the negligence or greed of some person has caused. Such a course would not be that of intelligently brave men. . . By eliminating unnecessary fires your risk would be lessened in proportion."

Mr. Wood, therefore, urged upon the firemen the realization that their greatest duty is not to risk their lives bravely in putting out fires but is rather to prevent them. If such prevention be intelligently and thoroughly carried out, the country could be saved a loss of one hundred and fifty million dollars a year, to be added to our other savings in the aid of the war fund.

BABYLON'S WEIGHTY TRAFFIC ARGUMENT.

Babylon, N. Y., has had considerable difficulty with the overthrowing and breaking of traffic signs or "silent policemen" stationed in the roadways in place of the flesh-and-blood traffic policemen to direct traffic. Recently a sign in the center of the roadway intersection of two of the principal thoroughfares has been constructed in a way which is expected to be more permanent. A sign "Keep to the Right," is supported by a block of concrete about 2 feet square at the base and 1 foot at the top and about 5 feet high, thus probably weighing about 1,850 pounds. It is believed that any reckless automobile driver who runs into this standard will wish that he had not. There has been some opposition to this standard as being dangerous to traffic, but the village has spent more than $75 replacing lanterns and other parts of the iron traffic sign at this point and felt that it was necessary for them to do something which would inspire in automobilists some respect for the "silent policemen."

SHALL PUBLIC WORK CONTINUE?

The following letter was received too late to be included in our symposium January 5th, but the author's opinions are so clearly and concisely expressed that we think it should be added. Mr. Frederick W. Donnelly, mayor of Trenton, N. J., writes:

I wish to place myself on record as favoring the continuance of essential public improvements in municipalities, notwithstanding the condition of turmoil which exists today.

I do not believe that any unnecessary improvement that would involve huge expenditures should be authorized, but I am just as firmly convinced that every municipality should provide for its needs in the line of public improvements if the progress of the age is to be maintained. It is impossible for a municipality or any other government entity to stand still. Either progress or retrogression must be made, and, if essential public improvements are to be neglected, municipalities of course would go backward, not forward.

I do not believe that the prices of material or labor will show any general decrease for many years to come; consequently nothing will be gained by deferring improvements on such an assumption.

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Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

SATISFYING THE USERS.

The present generation has seen a change in the attitude of the public utility companies from the defiant one of "The public be damned" to that of "The public be pleased," and the motto of the successful business man no longer is "Let the purchaser beware," but rather "Every purchaser must be satisfied." Any business that is going to last over tomorrow must make today's purchasers permanent customers.

It is in keeping with this modern spirit that dealers in certain materials used in public works are concerning themselves as much in seeing that such materials give satisfaction as in promoting their use—or rather, are relying on satisfaction given as the best kind of promotion. To insure satisfaction, they endeavor not only to sell good materials, but also to see that the purchasers so use their goods that they render the best service possible—to prevent dissatisfaction due to unwise use and for which the character of their goods is in no wise responsible.

Manufacturers of paving brick, granite blocks, cement and yellow pine are among those that have organized to take this progressive stand. The help that they can give to engineers and municipal officials is referred to in the letter of an engineer that is published in this issue.* As the author says, the fact that the ultimate motive of such associations is selfish does not detract from the value of the service they offer, for this service is of such a nature that it can benefit them only through the benefit it gives the users of their materials.

The intelligent selfishness of these manufacturers, if developed to its limit, might even be relied upon to a considerable extent in choosing between the several classes of material offered. For use of a given material for a purpose or under conditions to which it is not suited is as liable to cause dissatisfaction to the user as improper use or poor material. The user is likely to condemn for this reason a material that is easily the best under other conditions, and this may prejudice him and others against the use of it for work for which it would be the most suitable material. None of the manufacturers' associations have yet developed to this point, however, and the user must discount their claims in making his selection.

We believe, however, that the wisdom of this further step in advance is being glimpsed by some of the leaders in this movement, and that the time is near when the most progressive manufacturers will admit that there are conditions for which their particular materials are not suitable. Many engineers still are suspicious of advice offered by manufacturers' associations as to the best methods of using their materials, because they have found unreliable some of the claims as to where such materials can be used advantageously. When the companies will frankly and intelligently set forth the conditions under which their respective materials can not be used to advantage, as well as those under which they can be so used, we believe they will have taken a long step toward securing the more complete confidence of consumers and the general satisfaction with their goods which will prove their best recommendation.

LIFE CONSERVATION.

Every male between the ages of 18 and 31 is a possible soldier in this war, and every worker above the age of 16 is needed to a greater degree than ever before. The community has invested an average of $200 or more in the education of each such individual. For these and other reasons it is interested in preserving the lives of its citizens from a strictly selfish or utilitarian point of view, and failure to do so is a waste of its most valuable resources. It takes twenty years to raise a man to take the place of each one who dies, and the necessity of the present world emergency will not wait.

Life conservation (including health conservation, which is but a variation of it) is the most important duty of American cities today.

How the Federal Government, through the Public Health Service, took active steps to conserve life in one city where conditions seemed to demand its attention, is told in the leading article in this issue. Other cities will do well to read carefully the health program laid out for Leavenworth and scrutinize their own conduct of such matters to learn whether it measures up to the high standard of health conservation that every community should set for itself in duty to the country at large as well as to its own citizens.

FUEL CONSERVATION AND THIS ISSUE.

Readers may notice a scarcity of illustrations in this issue of Municipal Journal. This was caused by the fuel conservation order which, in closing industries from Friday to Tuesday, made it impossible for our engraver to prepare for us the cuts on which we had counted. This necessitated a revision of plans and deferring to later issues the articles that are to be illustrated.

We make this as an explanation to our readers, and not as a complaint against the order. The inconvenience was a small sacrifice to make if it assisted in the slightest degree in straightening out the congestion of war traffic that has resulted from the most severe winter weather ever recorded in the eastern United States, combined with the heaviest freight traffic our railroads have ever been called upon to carry.

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*As we go to press we find that this letter has been lost by the printer. It will appear next week if found.

CITY PAYMENTS FOR FIRE PROTECTION

The report of the U. S. Census Bureau for the year 1916 dealing with the finances of cities gives for each city of more than 30,000 population the payments made for carrying on the fire department, the per cent which such expenditure is of all the expenditures of the city for that year, and the value of the property, including land, buildings, and equipment, employed for fire department purposes. These figures have been compiled in the accompanying tables. Table No. 1 gives, for each city, the population estimated as of the middle of the fiscal year 1916, the per capita payment for operation of the fire department, the percentage which this is of all expenses, and the total and per capita values of properties and equipment devoted to fire department purposes.

In another table is given a list of the cities which spent the most and those which spent the least for fire department purposes, arranged in the order of such per capita expenditures. A third gives the cities which show the highest and lowest percentages of such expenditures in comparison with the total expenditures of the city. A fourth gives a list of those cities which possessed the highest per capita and the lowest per capita values of fire department property. Still another table gives the states in which are found cities of more than 30,000 population, arranged in the order of the per capita expenditures for fire department purposes of such cities, the amount given being in each case the average of the expenditures of all of the cities in the state of more than 30,000 population. It will be noted that in the second, third and fourth tables, the cities listed are almost entirely different in each. There appear in the lists of maximums the following duplicates: San Francisco, Brookline, Atlantic City, Springfield, Niagara Falls, Galveston, Macon, and Chattanooga, each appear in two tables. No city appears in all three. In the list of minimum expenditures, Wilmington, Chester, Perth Amboy and Harrisburg appear in two tables; while Bellingham, Newport and Norristown appear in all three. The figure of 2c per capita as the value of property in Wilmington, Del., seems to be impossibly low, but it is given as such in the census reports and repeated letters to the municipal department asking whether this is incorrect, have brought no response.

Taking the averages of the entire 213 cities of more than 30,000 population, the census report gives the average value per capita of property and equipment as $3.35; the average for cities of 500,000 or more being $2.40, that for cities of 300,000 to 500,000 being $5.62 (this average is largely affected by San Francisco's value, which is fully 6 times the average of the other cities of the group), that of the cities between 100.000 to 300,000 being $3.67, that of the cities between 50,000 and 100,000 being $3.54, and of the cities of 30,000 to 50,000, $3.47.

The average expenses of all cities are given as $1.65 for the entire country; $1.57 for the group of largest cities, $2.10 for the second group, $1.71 for the third group, $1.53 for the fourth group and $1.44 for the fifth group.

Per Capita Value of Property and Equipment Used for Fire Department Purposes.

(The highest and lowest.)

City	Amt.	City	Amt.
San Francisco	$20.28	Decatur, Ill.	$1.71
Springfield, Mass.	8.47	Bellingham, Wash.	1.65
Atlantic City, N. J.	8.43	Pueblo, Colo.	1.65
Stockton, Cal.	7.99	Huntington, W. Va.	1.61
Galveston, Tex.	7.03	Easton, Pa.	1.52
New Rochelle, N. Y.	6.93	Chicago, Ill.	1.52
San Diego, Cal.	6.92	Portsmouth, Va.	1.40
Brookline, Mass.	6.88	McKeesport, Pa.	1.39
Newton, Mass.	6.74	Charlotte, N. C.	1.27
Mount Vernon, N. Y.	6.59	Chester, Pa.	1.07
Holyoke, Mass.	6.51	Norristown, Pa.	.97
Niagara Falls, N. Y.	6.34	Newport, Ky.	.82
Chattanooga, Tenn.	6.26	Wilmington, Del.	.02

Cities Arranged in the Order of Per Capita Expenditures.

(The highest and lowest.)

City	Amt.
San Francisco	$3.64
Brookline, Mass.	3.55
Atlantic City, N. J.	3.26
Springfield, Mass.	3,20
Niagara Falls, N. Y.	2.72
Portland, Me.	2.56
Butte, Mont.	2.55
Seattle, Wash.	2.52
Hartford, Conn.	2.48
Boston, Mass.	2.47
Galveston, Tex.	2.44
Buffalo, N. Y.	2.43
Macon, Ga.	2.42
Wilmington, Del.	.79
Kenosha, Wis.	.77
Chester, Pa.	.67
Perth Amboy, N. J.	.65
Reading, Pa.	.65
Lancaster, Pa.	.64
Harrisburg, Pa.	.61
Bellingham, Wash.	.60
York, Pa.	.59
Winston-Salem, N. C.	.57
Newport, Ky.	.51
Norristown, Pa.	.32

Percentage Fire Expenditures Are of All Expenditures.

(The highest and lowest).

City	Per cent.
Danville, Ill.	20.8
Macon, Ga.	19.1
East St. Louis, Ill.	18.3
Terre Haute, Ind.	17.6
Omaha, Neb.	17.5
Pueblo, Colo.	17.3
Knoxville, Tenn.	17.1
Manchester, N. H.	16.7
Woonsocket, R. I.	16.6
Charleston, S. C.	16.4
Chattanooga, Tenn.	16.0
Superior, Wis.	15.9
Birmingham, Ala.	15.8
Covington, Ky.	15.8
New York, N. Y.	6.8
Newton, Mass.	6.5
Salt Lake, Utah	6.4
Bellingham, Wash.	6.3
Pasadena, Cal.	6.3
Pittsfield, Mass.	6.2
Perth Amboy, N. J.	6.1
Newport, Ky.	6.0
Norristown, Pa.	5.6
Harrisburg, Pa.	5.2
Philadelphia, Pa.	4.5

States Arranged in the Order of the Per Capita Expenditures for Fire Purposes of the Cities of More Than 30,000 Population.

Name	Amt.	Name	Amt.
Maine	$2.56	Texas	$1.56
Montana	2.55	Illinois	1.55
New Hampshire	2.13	Arkansas	1.54
California	2.05	New Jersey	1.53
Oregon	1.98	Colorado	1.53
S. Carolina	1.87	Washington	1.49
Minnesota	1.83	Michigan	1.47
Georgia	1.82	Virginia	1.46
New York	1.82	Kansas	1.41
Nebraska	1.80	Iowa	1.36
Rhode Island	1.79	Alabama	1.34
Massachusetts	1.77	Kentucky	1.32
Florida	1.74	Idaho	1.31
Maryland	1.68	W. Virginia	1.30
Connecticut	1.67	Ohio	1.30
Indiana	1.66	Oklahoma	1.03
Tennessee	1.64	Utah	.99
Missouri	1.63	Pennsylvania	.94
Wisconsin	1.59	N. Carolina	.81
Louisiana	1.58	Delaware	.79

PROPERTY AND EXPENDITURES FOR FIRE DEPARTMENT PURPOSES IN 1916

Compiled from reports of the U. S. Census Bureau.

State and City	Population in 1916	Per capita payments for expenses	Per cent of all expenses	Value of Property: Total	Value of Property: Per capita
Alabama:					
Birmingham	172,119	$1.36	15.8	$360,229	$2.09
Mobile	56,295	1.24	14.0	257,500	4.58
Montgomery	42,908	1.43	15.1	195,426	4.55
Averages		$1.31	15.1		$3.74
Arkansas:					
Little Rock	55,158	$1.54	15.0	$181,336	$3.29
California:					
Berkeley	56,266	1.84	11.1	188,670	3.35
Fresno	34,280	2.06	11.9	183,000	5.34
Los Angeles	489,589	1.82	7.1	1,390,648	2.84
Oakland	194,703	1.98	11.4	757,187	3.88
Pasadena	45,154	1.33	6.3	198,000	4.38
Sacramento	64,806	2.12	11.1	245,187	3.78
San Diego	51,115	2.37	8.4	354,030	6.92
San Francisco	459,762	3.64	15.0	9,330,005	20.28
San Jose	37,918	1.75	11.9	208,605	5.50
Stockton	34,508	1.57	8.2	275,750	7.99
Averages		$2.05	10.2		$6.43
Colorado:					
Colorado Springs	32,344	$1.21	8.6	$65,250	$2.02
Denver	153,161	1.50	8.4	570,000	3.72
Pueblo	52,840	1.84	17.3	87,288	1.65
Averages		$1.53	11.4		$2.46
Connecticut:					
Bridgeport	119,220	$1.94	12.7	$545,916	$4.57
Hartford	109,452	2.48	11.7	618,960	5.65
New Britain	52,601	.91	7.8	139,764	2.65

PROPERTY AND EXPENDITURES FOR FIRE DEPARTMENT PURPOSES IN 1916 (Continued).

State and City	Population in 1916	Per capita payments for expenses	Per cent of all expenses	Value of Property	
				Total	Per capita
Connecticut (Continued).					
New Haven	147,095	1.69	10.4	632,790	4.30
Waterbury	84,745	1.31	8.9	320,340	3.78
Averages		$1.67	10.3		$4.19
Delaware:					
Wilmington	93,713	$0.79	7.8	$2,225	$0.02
District of Columbia:					
Washington	361,329	1.90	7.4	1,394,030	3.85
Florida:					
Jacksonville	73,137	1.82	12.5	347,877	4.75
Tampa	52,506	1.66	12.0	161,242	3.07
Averages		$1.74	12.25		$3.91
Georgia:					
Atlanta	184,873	$1.48	10.9	$729,404	$3.94
Augusta	49,848	1.59	10.8	180,800	3.62
Macon	45,415	2.42	19.1	185,000	4.07
Savannah	65,064	1.80	13.1	288,517	4.43
Averages		$1.82	13.45		$4.01
Idaho:					
Boise	32,443	$1.31	10.6	$128,425	$3.96
Illinois:					
Aurora	33,613	1.03	8.5	86,700	2.58
Chicago	2,447,845	1.36	6.8	3,737,697	1.52
Danville	31,790	2.15	20.8	110,400	3.47
Decatur	38,961	.98	9.5	67,000	1.71
E. St. Louis	72,103	2.04	18.3	138,016	1.91
Joliet	37,651	1.14	8.4	81.176	2.15
Peoria	70,732	2.15	13.9	224,900	3.18
Quincy	36,775	1.64	14.8	128,088	3.48
Rockford	53.761	1.52	11.9	168,121	3.12
Springfield	59,868	1.52	12.6	181,266	3.02
Averages		$1.55	12.55		$2.61
Indiana:					
Evansville	72,125	$1.43	12.7	$192,500	$2.66
Fort Wayne	74,352	1.45	12.2	219,250	2.94
Indianapolis	265,578	2.16	11.9	1,019,760	3.83
South Bend	67,030	1.07	10.3	156,120	2.32
Terre Haute	64,806	2.20	17.6	201,330	3.10
Averages		$1.66	12.94		$2.97
Iowa:					
Cedar Rapids	36,764	$1.18	7.4	$85,254	$2.31
Council Bluffs	31,219	.95	8.3	161,000	5.15
Davenport	48,207	1.95	12.6	150,200	3.11
Des Moines	99,757	2.13	13.5	493,591	4.94
Dubuque	39,687	1.29	11.6	182,200	4.59
Sioux City	55,960	1.16	8.1	167,800	2.99
Waterloo	34,488	.85	8.3	881,300	2.56
Averages		$1.36	10.0		$3.66
Kansas:					
Kansas City	96,854	$1.59	14.4	$200,613	$2.07
Topeka	47,914	1.32	11.1	138,858	2.91
Wichita	67,847	1.32	14.5	138,160	2.03
Averages		$1.41	13.33		$2.34
Kentucky:					
Covington	56,520	$1.21	11.0	$162,700	$2.87
Lexington	39,703	1.95	15.8	74,650	1.88
Louisville	236,379	1.62	11.1	711,553	3.01
Newport	31,722	.51	6.0	26,037	.82
Averages		$1.32	10.97		$2.14
Louisiana:					
New Orleans	366,484	$1.46	10.6	$1,295,000	$3.53
Shreveport	34,068	1.71	15.3	175,283	5.14
Averages		$1.58	12.95		$4.33
Maine:					
Portland	63,014	$2.56	13.9	$140,000	$2.22
Maryland:					
Baltimore	584,605	1.68	9.7	3,372,529	5.76
Massachusetts:					
Boston	746,084	2.47	8.0	3,122,300	4.18
Brockton	65,604	1.71	10.2	198,150	3.02
Brookline	31,934	3.55	9.6	219,900	6.88
Cambridge	111,997	1.44	7.3	363,891	3.24
Chelsea	43,979	1.58	10.6	123,950	2.81
Everett	38,307	1.33	8.4	136,036	3.55
Fall River	126,904	1.36	9.1	493,294	3.88
Fitchburg	41,091	1.88	10.1	171,963	4.18
Haverhill	47,774	1.57	9.7	249,288	5.21
Holyoke	63,968	2.29	13.7	416,581	6.51
Lawrence	98,197	1.19	8.9	318,925	3.24
Lowell	112,124	1.67	11.5	532,607	4.75
Lynn	100,316	1.45	9.3	510,289	5.08
Malden	50,067	1.32	8.2	165,500	3.30
New Bedford	114,454	1.38	8.9	432,081	3.77
Newton	43,085	1.87	6.5	291,700	6.74
Pittsfield	37,580	1.05	6.2	138,000	3.67
Quincy	37,251	1.75	9.8	148,610	3.98
Salem	47,778	1.50	2.5	157,775	3.30
Somerville	85,460	1.37	8.6	501,700	5.87
Springfield	102,989	3.20	12.9	874,250	8.47
Taunton	35,930	1.58	10.8	219,500	6.10
Waltham	30,166	1.32	7.8	110,352	3.65
Worcester	160,291	1.77	8.7	685,756	4.27
Averages		$1.77	9.35		$4.53
Michigan:					
Bay City	47,718	$1.25	11.0	$169,097	$3.64
Detroit	563,250	2.04	9.6	2,474,846	4.39
Flint	52,594	1.17	12.7	89,940	1.71
Grand Rapids	126,392	1.85	12.5	475,428	3.76
Jackson	34,730	1.37	10.6	140,750	4.05
Kalamazoo	47,744	1.32	12.6	94,750	1.90
Lansing	39,403	1.68	15.1	118,646	3.003
Saginaw	55,228	1.06	8.7	143,183	2.59
Averages		$1.47	11.60		$3.12
Minnesota:					
Duluth	91,913	$2.00	13.8	$280,796	$3.05
Minneapolis	353,460	1.57	8.5	1,214,876	3.43
St. Paul	241,999	1.93	12.9	830,000	3.38
Averages		$1.83	11.73		$4.28
Missouri:					
Joplin	33,124	$1.53	12.6	$59,300	$1.79
Kansas City	292,615	1.79	9.8	542,278	1.85
St. Joseph	84,361	1.70	15.0	223,000	2.64
St. Louis	749,183	1.60	8.3	1,857,389	2.47
Springfield	39,927	1.54	15.3	143,500	3.69
Averages		$1.63	$12.20		$2.47
Montana:					
Butte	43,004	$2.55	13.1	$119,500	$2.77
Nebraska:					
Lincoln	45,900	$1.10	7.5	$87,000	$1.89
Omaha	163,200	2.50	17.5	625,489	3.21
Averages		$1.80	12.50		$2.55
New Hampshire:					
Manchester	76,959	$2.13	16.7	$428,203	$5.56
New Jersey:					
Atlantic City	55,806	$3.26	12.6	$472,000	$8.45
Bayonne	68,352	1.51	9.7	153,498	2.24
Camden	104,349	1.42	10.7	325,000	3.11
East Orange	41,155	1.12	7.4	171,473	4.16
Elizabeth	85,620	1.32	11.2	333,069	3.89
Hoboken	76,483	1.89	11.6	304,555	3.98
Jersey City	299,615	1.60	11.2	625,010	2.08

PROPERTY AND EXPENDITURES FOR FIRE DEPARTMENT PURPOSES IN 1916 (Continued).

State and City	Population in 1916	Per capita payments for expenses	Per cent of all expenses	Value of Property	
				Total	Per capita
New Jersey (Continued).					
Newark	399,000	1.74	7.5	1,428,274	3.57
Orange	32,524	1.36	9.6	83,876	2.54
Passaic	70,377	1.06	9.6	211,847	3.01
Paterson	137,408	1.72	14.7	396,291	2.88
Perth Amboy	39,725	0.65	6.1	97,644	2.45
Trenton	109,602	1.51	11.2	317,224	2.89
West Hoboken	41,893	0.96	10.1	65,100	1.31
Averages		$1.53	10.23		$3.33
New York:					
Albany	103,580	$2.41	13.9	$592,416	$5.71
Amsterdam	36,163	1.07	11.3	108,435	2.99
Auburn	37,166	1.74	11.8	115,700	3.11
Binghamton	53,082	1.42	10.2	210,000	3.95
Buffalo	464,946	2.43	10.2	1,650,832	3.55
Elmira	37,768	1.72	11.6	132,325	3.45
Jamestown	35,871	1.37	9.3	82,100	2.28
Mount Vernon	36,355	1.96	7.9	239,692	6.59
New Rochelle	36,326	1.56	7.7	251,950	6.93
New York	5,468,190	1.68	6.8	10,262,847	1.87
Niagara Falls	36,240	2.72	14.4	230,096	6.34
Rochester	250,747	2.12	10.8	1,107,390	4.41
Schenectady	95,265	1.25	8.5	349,500	3.66
Syracuse	152,534	1.64	9.7	679,000	4.45
Troy	77,738	1.37	8.3	451,478	5.85
Utica	83,876	2.18	15.4	369,819	4.40
Yonkers	96,610	2.38	10.1	357,600	3.69
Averages		$1.82	10.46		$4.37
North Carolina:					
Charlotte	39,199	$1.05	13.2	$50,000	$1.27
Winston-Salem	30,448	0.57	7.4	79,350	2.60
Averages		$0.81	10.30		$1.93
Ohio:					
Akron	82,958	$1.25	9.1	$352,000	$4.24
Canton	59,139	1.12	10.3	152,446	2.57
Cincinnati	406,706	1.97	8.2	2,150,230	5.28
Cleveland	657,311	1.37	7.4	1,707,014	2.59
Columbus	209,722	1.68	10.9	779,323	3.71
Dayton	125,509	1.30	9.4	545,773	4.34
Hamilton	39,655	1.10	11.4	149,563	3.77
Lima	36,644	1.09	12.6	69,144	1.88
Lorain	35,662	1.09	10.5	160,300	4.49
Springfield	50,804	1.00	8.5	205,300	4.04
Toledo	187,840	1.64	11.9	680,000	3.61
Youngstown	104,489	1.13	9.7	366,888	3.51
Zanesville	30,406	1.19	12.4	75,000	2.46
Averages		$1.30	10.18		$3.57
Oklahoma:					
Muskogee	42,740	$0.93	12.3	$108,000	$2.52
Oklahoma City	90,620	1.13	12.8	347,703	3.83
Averages		$1.03	12.55		$3.18
Oregon:					
Portland	271,814	$1.98	13.3	$1,196,210	$4.40
Pennsylvania:					
Allentown	61,914	$0.89	9.8	$293,268	$4.73
Altoona	57,606	1.10	11.8	123,500	2.14
Chester	40,935	0.67	7.5	43,900	1.07
Easton	30,206	1.07	10.3	46,100	1.52
Erie	73,810	1.55	13.5	270,757	3.66
Harrisburg	70,754	0.61	5.2	168,585	2.38
Johnstown	66,601	1.15	11.9	208,650	3.10
Lancaster	50,512	0.64	8.0	108,500	2.14
McKeesport	46,749	0.95	8.5	65,185	1.39
New Castle	40,351	0.87	8.3	76,671	1.90
Norristown	30,833	0.32	5.6	30,000	0.97
Philadelphia	1,683,664	0.86	4.5	3,212,609	1.90
Pittsburgh	571,984	1.93	8.2	2,639,833	4.61
Pennsylvania (Continued).					
Reading	107,594	0.65	7.2	358,025	3.32
Scranton	141,081	1.03	9.6	279,041	1.93
Wilkes-Barre	75,231	0.97	8.3	311,685	4.14
Williamsport	33,495	1.14	10.6	107,185	3.20
York	50,543	0.59	7.8	209,190	4.13
Averages		$0.94	8.70		$2.67
Rhode Island:					
Pawtucket	58,156	$1.58	10.5	$226,646	$3.89
Providence	248,791	1.99	11.5	1,110,449	4.46
Woonsocket	43,355	1.81	16.6	111,800	2.57
Averages		$1.79	12.86		$3.64
South Carolina:					
Charleston	60,427	$2.16	16.4	$174,585	$2.88
Columbia	34,058	1.58	14.0	160,000	4.69
Averages		$1.87	15.20		$3.78
Tennessee:					
Chattanooga	58,201	$1.74	16.0	$364,550	$6.26
Knoxville	38,206	2.02	17.1	215,572	5.63
Memphis	146,113	1.45	10.8	814,077	5.57
Nashville	115,978	1.34	10.6	367,495	3.16
Averages		$1.64	8.62		$5.15
Texas:					
Austin	34,016	$0.79	7.6	$133,000	$3.90
Dallas	121,277	1.63	11.4	673,808	5.55
El Paso	60,754	1.28	10.6	172,124	2.83
Fort Worth	99,528	1.13	12.6	494,855	4.97
Galveston	41,207	2.44	12.8	290,035	7.03
Houston	108,172	1.61	11.1	390,165	3.60
San Antonio	121,274	1.66	1.33	370,295	3.05
Waco	32,913	1.99	13.2	195,772	5.94
Averages		$1.56	11.57		$4.61
Utah:					
Ogden	30,466	$0.98	7.0	$107,000	$3.51
Salt Lake City	113,567	1.00	6.4	244,175	2.15
Averages		$0.99	6.70		$2.83
Virginia:					
Lynchburg	32,431	$1.75	12.9	$73,748	$2.27
Norfolk	88,844	1.57	11.0	213,282	2.40
Portsmouth	38,610	1.01	13.2	54,318	1.40
Richmond	154,841	1.64	11.7	493,680	3.18
Roanoke	41,929	1.35	14.3	166,410	3.96
Averages		$1.46	12.60		$2.64
Washington:					
Bellingham	31,609	$0.60	6.3	$52,466	$1.65
Everett	33,767	1.26	10.6	70,355	2.08
Seattle	330,834	2.52	12.8	1,676,691	5.06
Spokane	142,990	1.39	10.7	423,204	2.95
Tacoma	108,094	1.67	13.3	449,351	4.15
Averages		$1.49	10.74		$3.17
West Virginia:					
Huntington	44,600	$0.97	11.8	$72,200	$1.61
Wheeling	43,237	1.63	14.4	188,318	4.35
Averages		$1.30	13.10		$2.98
Wisconsin:					
Kenosha	30,738	$0.77	7.5	$62,150	$2.02
La Crosse	31,522	1.60	13.4	105,400	3.34
Madison	30,084	1.83	10.2	139,829	4.64
Milwaukee	428,062	1.67	8.5	1,327,272	3.10
Oshkosh	35,460	1.57	13.9	100,000	2.82
Racine	45,507	1.43	11.4	145,073	3.19
Superior	45,050	2.31	15.9	171,069	3.80
Averages		$1.59	11.54		$3.27

The WEEK'S NEWS

Iowa Counties Cooperate to Lower Cost of Highway Materials—The Government's Truck Transportation System—Court Decides Against Luten Bridge Patents—Systems to Mitigate Electrolysis in Trenton—Chicago's and San Antonio's Police Chiefs Found Not Guilty of Charges—Dallas Firemen Strike—Fires in Marlinton, W. Va.; New York City, and Middletown, Conn.—Mayor Gill of Seattle in Trouble Again—City Manager Affairs in Middletown, O.; Grove City, Pa.; Xenia, O., and Ocala, Fla.—Oshkosh Wants Municipal Fuel and Ice.

ROADS AND PAVEMENTS

Cooperative Buying for County Highway Work.

Des Moines, Ia.—County boards are asked to proceed with the necessary road and bridge improvements in a wise and conservative manner in 1918, regardless of the abnormal conditions growing out of the war, according to advice given by the executive committee of the county supervisors' association of Iowa in a resolution adopted at a recent meeting. The system of cooperative buying for county highway construction has been inaugurated. A member from each congressional district makes up the executive committee, authorized at the last convention in Waterloo. These eleven men asked for bids on bulk orders of lumber, cement, piling and reinforcing steel to be used by all the counties in 1918 in their road and bridge improvements. The purpose is to secure a lower price and prompter shipments. The committee barred no one from the bidding, whether he be a large or a small dealer. The only condition was that the bidder designate the amounts of material which he can furnish at the price bid. It is also ruled that the operation of the bid shall be confined to the county or counties the bidder may designate. This plan of buying materials in large quantities, in order to secure a lower price, was highly commended by governor W. L. Harding. Estimates secured from counties show that approximately 14,000,000 feet, board measure, of rough bridge timbers, 480,000 lineal feet of piling, 75,000 barrels of cement and approximately 4,300,000 pounds of reinforcing steel will be wanted by the counties. Contracts for the material are to be made direct by each county board with the firms submitting the low bids on the entire supply. The firm is expected to ship to each county as orders are sent in from the county. "All bids will be subject to acceptance within thirty days and contracts for material will be made direct with each county board that wishes to take advantage of the prices secured," declares the advertisement of the executive committee of the association. "The quality of the material is to be in accordance with the standard specifications of the state highway commission."

Government Inaugurates Truck Train Schedule.

Washington, D. C.—The war department has formally announced the successful completion of the trip from Detroit to the Atlantic seaboard of the first United States quartermaster motor-truck train. These trucks will soon be sent to France, and their drivers, who were comparatively inexpeienced at the outset of the journey across the states, are now regarded as capable of operating trucks in the war zone. As a result of the success of the trial trip it is announced by the quartermaster department that, beginning January 10 and continuing for six week days, truck trains started each day from Detroit for the seaboard. The test movement was one of railroad relief as well as a try-out of the trucks making the journey. Each truck brought two tons of supplies and saved its own haulage on the railroads. A freight car will accommodate but two trucks. A greater utilization of the highways for freight traffic is forecast by the success of the Detroit-to-seaboard trip. The quartermaster department is planning to bring thousand of trucks on their own wheels to the Atlantic coast, thereby relieving to an extent the freight congestion. The laying out of other military routes for the movement of trucks and supplies may result.

A further use of highways is forecast by a recent statement of the postoffice department: "Within, perhaps, the next three months motor trucks parcel-post routes will be in operation in various parts of the country aggregating between 3,000 and 4,000 miles. One chain of motor routes will extend from Portland, Me., to New Orleans. Another will cover much of a large stretch of territory in Ohio, Indiana, Illinois and West Virginia. On the Pacific coast routes will be established between San Francisco and Sacramento, Cal., via Stockton and Fruitdale, a distance of 125 miles, and between Redlands and Los Angeles, Cal., via Ontario and Pomona, Cal., a distance of 76 miles. It is the belief of the post office department that the operation of these routes and others to be established will materially aid in the distribution and in lowering the cost of food products. The existing law does not provide for the employment of government owned motor trucks on rural delivery routes, nor does it require the rural carriers to use motor vehicles. In the star-route service, however, where the mail is carried under contract, a recent law permits the post office department to designate the sort of vehicles to be employed, and in awarding new contracts the department will specify that motor trucks shall be employed on all routes where the roads are such as to admit of their use. These contracts are advertised for bidders, and where payment asked for the service is deemed to be excessive the department is authorized to provide government-owned motor trucks and to employ drivers for the operation of these routes. A further extension of the employment of government owned motor vehicles by its adoption for the parcel post service of the rural routes will be made whenever Congress enacts a law now pending for that purpose.

Luten Bridge Patents Held Invalid.

Des Moines, Ia.—United States district judge Martin J. Wade has dismissed the complaint of Daniel B. Luten against J. B. Marsh, et al., by which the plaintiff sought to establish a right to 10 per cent royalties on the contract price of a large proportion of the concrete bridge and culvert construction which has taken place in Iowa during the past twelve or thirteen years. Quoting the maxim that "he who comes into equity must have clean hands," the court intimated that the plaintiff's methods "in the business of constructing bridges or getting the business of designing bridges" had been such that it was a question whether he should not be denied because his methods had been such as "no court can approve." The court however, based its decision upon the ground that the patents in question were not valid and that they were based upon methods of construction which were in common use by contractors and builders in many cases for years before the plaintiff had applied for his patents. Ten miniature replicas of bridges in various states of the union were received as exhibits for the defendants for the purpose of proving their contention that the plaintiff's inventions were nothing more nor less than ordinary methods of construction long in common use by builders of concrete bridges and culverts. The plaintiff asked for $2,000,000 to cover the value of royalties alleged to be already earned and unpaid and for an adjudication which would establish a legal right on his part to collect several million dollars more during the life of his patents. He has already collected large sums as royalties in various parts of the country and substantial sums have been paid to him in Polk county and other parts of Iowa. The state highway commission is entitled to the credit for beginning the fight against Luten's demands. On the basis of an opinion, which held in effect that Luten's patents were invalid, the highway commission refused to consider the plaintiff's demands when planning bridge construction work for the state. Although the state of Iowa was not a party of record to the suit as originally brought, the governor, under a special statute passed in 1913, which empowered the state, at the discretion of the governor, to come in and defend in any suit in which the public interest was concerned, directed attorney general Havner to look out for the state's interest. The plaintiff predicated his claim for an accounting and the payment of future royalties on 150 specific cases of alleged infringement of his patents in the state of Iowa. During the progress of the case the issues became narrowed down to twelve specific violations of the plaintiff's patent rights, principally due to the fact that the plaintiff withdrew four of his patents from the case. Judge Wade's verdict covered the other four of the eight patents. Judgment was granted against the plaintiff for costs. Judge Wade observed in his decision Luten has not been in the habit of perfecting his appeals, although he has entered notice of appeal in a number of cases. The attorneys for the defendants claim that Luten does not care to obtain the final decision of an appellate court. Judge Wade severely criticised Luten for bringing into the case as precedents, decisions which had been entered by consent of the parties in other jurisdictions in which he had brought suit. Judge Wade observed: "In view of the disclosures of this case, congress ought to pass a law providing that the attorney general or some one else might institute a proceeding testing the validity of the patent, settling the rights of the parties on both sides." Decisions adverse to Luten have already been rendered in Nebraska, Colorado, Kansas, Illinois, and Ohio, notwithstanding the fact that he has collected claims for royalties or infringements from many sources.

In the case of the patent, No. 851,970, which covers the paving of the bottom of the waterway under a bridge with a layer of concrete having a depressed end, Judge Wade denies the validity, stating that the practice was not new, and that no inventive genius was involved in varying the details of the method of paving. Other claims in this patent were concerned with extending the spandrels and wing walls to a distance and height sufficient to hold the earth fill from escaping at the ends of the spandrels. Judge Wade stated that while he could not determine the particular things claimed as invention there was no patentable novelty in the idea.

In considering patent No. 853,202, which covers the principle of providing tension members over the extended wall of an abutment to strengthen the structure at that point, Judge Wade decided that no variation in methods of reinforcement is patentable, since placing of reinforcing, he stated, is a problem of computation and part of the work of any skilled engineer. The same considerations entered into the decision on patent No. 853,203, which covers a method of reinforcing a concrete arch. While the decision admitted that there might be some invention in this patent it said that the claim referred only to the particular arrangement of the steel designated in the claims, and the bridge under review did not infringe on this arrangement.

In the case of patent No. 934,411 an improvement was claimed in the art of building a concrete wall up to a proposed line of projecting coping, allowing it to harden and then aligning the forms for the coping and completing it. Judge Wade decided that there was nothing patentable in this.

Celebrate Completion of Pacific Highway Link.

Seattle, Wash.—With appropriate speeches from county and city officials and engineers, and an opening ceremony by state highway commissioner James Allen, the citizens of this section celebrated the completion of the Duwamish-Renton Junction pavement, the final link in the all-paved highway from Seattle to Tacoma. There is now a continuous hard-surface pavement from a point north of Marysville to the Nisqually river, north of Tacoma. In reply to a challenge from Claude C. Ramsay, chairman of the King county commissioners, "I would like to have Samuel J. Humes, county engineer, tell us whether this road is honestly built," Mr. Humes replied: "In this three-mile stretch you will find every inch of pavement that the specifications call for. If you don't believe this, dig the road up at any place at my expense and test it. And hereafter every contractor for King county work is going to put in every inch that the specifications call for." "Because of inefficiency or dishonesty, the taxpayers haven't always got what they paid for," Mr. Ramsay had said.

Road Patrol System in Effect.

Salem, Ore.—With the abolition of the county road supervising system the new patrol system of keeping up the highways is in effect. The new plan, enacted by the legislature, provides for district patrolmen, who are to inspect the roads in their respective districts at all times of the year, and upon the discovery of any bad places therein are required to report the fact immediately to the county officials. In many instances the former road supervisors will be named to act in this capacity, but when necessary, other appointments will be made and allotments of territory given until the highways throughout the county are under proper supervision.

Paving by Car Company When City Orders.

Vincennes, Ind.—Where a street railroad operates under a franchise which requires it to pave a part of the street it can be mandated to construct the pavements ordered by the city. This has been established by the Indiana supreme court in reversing the Daviess circuit court for sustaining a demurrer to the complaint of the city of Vincennes on relation of the state against the Vincennes Traction Company to order the company to construct the paving between its rails and two feet on each side of the rails, as is required to be done by its charter. The court holds that where the company accepts a franchise which requires it to construct such paving it cannot question the wisdom of the city in ordering the street paved, as the power to decide the time and the manner of paving rests with the city authorities.

WATER SUPPLY

Build Pumping Station on Quicksands..

Evansville, Ind.—After a two-year fight with quicksands and other adverse conditions the Public Utilities company's new pumping station is complete. The pumping station represents an expenditure of approximately $150,000. It will pump all the water used by the Public Utilities company here. Two pumps, each handling 7,500 gallons of water a minute, are installed in the bottom of the well to pump the water supply, and there is room for two more whenever the needs of the company demand them. George E. Sloats, superintendent of the Public Utilities company's power plant, was in charge of the construction of the well. He says the chief difficulty met was with quicksands, which threatened the lives of workmen and destruction of the work continually. The well is fifty-six feet deep. At the bottom is a very thick floor, reinforced with steel rails. The entire structure is of reinforced concrete, with the exception of the ornamental tower at street level. This tower is erected of brick and is in the shape of a medieval battle turret. One of the pumps in the well is sufficient at present to supply the company's water needs. The other will be used as a reserve.

New City Filtration Plant in Operation.

Oshkosh, Wis.—The city's new filtration plant has been completed, and is now in operation. The cost of the building is approximately $185,000. The new submerged crib and intake, made necessary for the operation of the plant, cost approximately $35,300, and the required sewer through Menominee park entailed an outlay of nearly $3,600. The contract price of the filtration structure was $55,500, that of the appliances and accessories was $40,000, for the elevated steel tank, $7,950, and for the cover to the reservoir, $11,800. Another big item was the masonry enclosure, which cost $14,030. The tower involved an outlay of $1,200, and the clock located therein represents $500 more. Col. Henry A. Allen of Chicago designed the plant, furnished all the plans and specifications, and has been the city's consulting engineer throughout the period of its construction, which was started in April, 1916. Personal supervision of the work has been given by T. B. Jorgensen, Colonel Allen's resident engineer. Colonel Allen's fee for the entire work was 5 per cent of the original contract cost of the plant, or approximately $8,500. The plant has a capacity of six million gallons in twenty-four hours, which is about three million gallons in excess of the present amount of water consumed in the city daily. It is so constructed that an extension can be made to handle eight million gallons each twenty-four hours. The tower encloses a 50,000 gallon steel tank to hold enough filter wash water for the six filter beds, each of which can handle one million gallons daily. The plant is also equipped with a complete laboratory, where the water will be analyzed daily and given bacteriological examination. Its operating gallery is built with marble operating tables and white enameled brick railing and the floors are of tile.

STREET LIGHTING AND POWER

Install Electrolytic Mitigation Systems.

Trenton, N. J.—The Public Service Corporation has agreed to install and maintain an electrolysis mitigation system in this city. This agreement, similar to the one recently entered into by the Trenton & Mercer County Traction Corporation, was negotiated by E. E. Brownell, the electrolysis expert, employed by Trenton. Investigation has proved that escaping electricity from lines of the trolley companies destroy the city water mains and result in constant deterioration, expense and inconvenience. The electrolytic mitigation system is to be under the direction, supervision and control of E. E. Brownell. Mr. Brownell, consulting electrical engineer, is employed to represent the city as consulting electrical engineer for the purpose of supervising, directing and controlling the installation, completion and maintenance of the system and to prepare such surveys as may be necessary for doing such work and the proper maintenance thereof after completion. The employment of Mr. Brownell will be without cost to the city. The city enters into a 25-year contract with the engineer.

Rate in Franchise Held Not Permanent.

South Glens Falls, N. Y.—The Public Service Commission, Second District, has decided, in the case of the complaint of the trustees of the village of South Glens Falls against the United Gas, Electric Light & Fuel Company of Sandy Hill and Fort Edward, that the company is not restricted in its price for gas to the rate on which its franchise is based. In May the company filed with the commission its tariff increasing its price of gas in the village from $1.25 to $1.60 per 1,000 cubic feet. In November the village protested to the commission that the increase was illegal, because the franchise under which the company is operating provides that it shall charge only $1.25 per 1,000 cubic feet. The villages of Fort Edward and Hudson Falls made similar complaints later, but said they would abide by the decision in the South Glens Falls case. The commission dismisses the complaint, and in its decision says in part:

> There is no provision in the transportation corporations law which in any way seems to justify the contention that a municipality has the right to permanently fix in a franchise the rates which a gas or electric light company shall charge in the territory covered by the franchise. There is no statute which in any way fixes the rate to be charged for gas sold in these villages, except as the same is governed by the Public Service Commissions law. In this respect the situation is quite different from that relating to street railroads in which the law specifically provides for a certain rate of fare within the limits of an incorporated city or village, which, however, is subject to modification by the Legislature or by this commission. In the case of the Huntington Railroad Company we decided, November, 1917, that municipalities have no power to prescribe a rate in a franchise which shall always be controlling so as to deprive the state of the power to regulate the fare to be charged by a street railway. This pointed out that the franchise was binding until such time as the state interfered and prescribed a different rate. This applies with equal force to gas and electric light companies. If any increases are made in their rates a complaint may be made against them. If, after investigation, it is determined that the increased rates are unreasonable the commission has the power to revise and reduce them. It also has the power to increase rates provided the company can show that it is not earning a sufficient amount to give it a reasonable return upon the value of the property employed by it in the public service.
>
> Where there is a franchise restriction it is good as between the parties, but is not controlling as against the state when the facts would justify granting the relief but for the condition in the franchise. We are of opinion that the condition in the franchise granted by South Glens Falls is not controlling so as to prevent the commission from authorizing an increase in that rate in the event that the company can justify such increase on the ground that it is failing to earn a fair return on the value of its property employed in the public service. As the complainants rely entirely on the restriction in the franchise fixing the rate, and do not propose to contest the reasonableness of the increased rate if the matter is decided adversely to them it is our duty to dismiss the complaint.

In the answer filed by the company at the hearing the company contended that the raise in price is made necessary by reason of the fact that during the past five and one-half years the price of coal in the open market has advanced 120 per cent, and the price of coal at contract prices has advanced approximately 74.6 per cent; that the cost of manufacturing labor has advanced during said period 55.5 per cent, and that the taxes assessed against the company during said period have increased 37.6 per cent, resulting in a cost of delivery of gas to the company at the consumer's burner in the villages of $1.7594 per 1,000; that during each of the last five years and during the first six months of 1917 the cost of furnishing gas in each of said villages has exceeded the company's revenues; that during the first six months of 1917 there was an increased deficit in the company's gas business as compared with a corresponding period in the year 1916 of $1,174.25.

New Low Rates for Municipal Electric Plant.

Los Angeles, Cal.—Unanimous approval has been given by the council to the ordinance fixing the rates to be charged by the public service commission for municipal power. The rates include the new industrial power rates, ranging from 1.56 cents a kilowatt hour to 0.76 cents a kilowatt hour. The industrial users also will receive a 20 per cent discount if not more than 10 per cent of their consumption of power is after 4:30 p. m., when the peak load, or period of greatest consumption of electrical energy is in progress, extending until 9:30 p. m. The rate of 1.56 cents a kilowatt hour applies to power in excess of 6,000 kilowatts a month, after which the rate is stepped down to the lowest rates of 0.76 of a cent a kilowatt for all power in excess of 1,500,000 kilowatt hours a month.

FIRE AND POLICE

Chicago's Police Chief Not Guilty of Graft.

Chicago, Ill.—Charles C. Healey, former chief of police, has been declared "not guilty" in judge Sabath's court by a jury which for eight weeks listened to the trial of the charge that Healey was a grafter. With the former chief, William R. Skidmore, saloonkeeper and politician, and detective sergeant Stephen Barry, his co-defendants, were also given their liberty. Healey could not overcome his emotion; he wept and his body shook. He embraced his attorneys. Throughout the trial the former chief was very sick and on many days had to be carried into the court room. The indictment and trial was the direct outgrowth of state's attorney Hoyne's investigation of alleged irregularities in the city government during the summer and fall of 1916. The prosecutor issued a number of strong statements concerning corruption in the police department, but it was not until his men raided the Sportsmen's Club of America in connection with the slot machine inquiry that the then chief was named directly as being connected with alleged grafting. The prosecutor caused a raid to be made on the police department offices in the city hall. Documents and vice reports from the office of the second deputy superintendent were seized, and only the massed forces of the city hall, headed by corporation counsel Ettelson, prevented the raiders from carrying away the files of correspondence and police reports from the chief's office. Mayor Thompson took up the cause of his chief, and charges were made that Mr. Hoyne's attack was made for campaign purposes in order to defeat city prosecutor Harry B. Miller, the city hall candidate for state's attorney against Mr. Hoyne. The prosecutor, after his re-election, continued his attacks against the chief and on December 18 the mayor forced Mr. Healey to resign. He retired on January 11. The chief's exit was hurried by the dramatic raid which Hoyne's forces made on the office of Thomas Costello on January 8, and the arrest of Costello, "Mike de Pike" Heitler, W. R. Skidmore and police lieutenant Augustus Martin White. Nearly $1,000, said to be graft collections which the four men were splitting, was seized, as well as documents and notations from Costello's desks. This data, acording to the prosecutor, proved the men were engaged in a regular business of extorting tribute from gambling houses and resorts, with the connivance of the chief. After nightfall on the same day assistant state's attorneys and detectives from Mr. Hoyne's office gained entrance to the chief's residence under the guise of newspaper reporters and arrested the chief. The telephone wires of the chief's residence, of Costello's office and residence, and the Skidmore saloon had been tapped by the state's attorney's forces. The grand jury indicted Healey, Barry and Skidmore on conspiracy charges. The three men were sent to trial on October 15 before judge Joseph Sabath. Costello, the principal witness, told how the former chief shifted commanding officers from district to district at his request, and sent lesser officers who interfered with protected traffic in vice and gambling to "the woods." He indicated that he had paid the former chief graft money as far back as 1898. He charged that he and Healey had plotted to sell sergeant promotions to patrolmen for $250 each. Costello named Barry and Skidmore as partners in the profits of the syndicate from resort tribute and gambling house profits, and said both collected money from resort keepers. The defense of the three accused men was conducted individually, but along similar lines. All charged that the case against them was a "frame-up." The former chief denied that he had ever had criminal dealings with any man at any time during his police career. He admitted he had known Costello for some thirty years, but had never held any confidential relations with him. Mr. Healey made denial of all the sixty alleged telephone talks between himself and Costello. His attorneys endeavored to show that their client was the unfrotunate victim of the political fight between Hoyne and the mayor. The "star" testimony of Costello was utterly disregarded by the jury, it was declared by a member of it. The jurors did not believe the evidence contained in the tapped wire conversations. The state's witnesses admitted their inability to use shorthand and the attorneys for the defense proved these same witnesses could not write rapidly enough in longhand to have taken down the conversations charged. Furthermore, the state admitted the original notes were lost and altogether the evidence looked thin.

City Water and Light Plant Burned.

Marlinton, W. Va.—The building and machinery of the municipal light and water plant has been destroyed by fire. The flames were discovered over the boiler room. Frozen hydrants caused delay in fighting the fire and the plant was almost entirely consumed before a stream of water could be directed on the flames. The water and light plant was located next to a tanning plant, with which connections was made so that water was pumped into mains and furnished the city from the Greenbrier river. The city was left without lights. The plant was purchased by the city last fall.

Fight Difficult Fire in Brewery Stable.

Syracuse, N. Y.—Thirty-four horses were burned to death and property estimated in value between $100 000 and $150,000 was destroyed by a fire which raged for four hours in the plant of a brewing company. Buildings adjoining the plant, including a storage company's $80,000 warehouse with contents valued at $500,000, were saved after a desperate fight. Every piece of apparatus in the fire department and every man on duty was used, at one time or another, on the work. Dwelling houses across the street and west of the brewing plant were showered with sparks for hours, but were protected by a blanket of snow on their roofs. A roof on one of the smaller buildings of the gas works, directly across Onondaga creek from the brewery, caught fire, but was extinguished. The garage contained several tons of wrapping paper and about 1,000 cases of bottles. There were sixteen auto trucks on the lower floor, with two light cars. All of the trucks were removed by the police and spectators, but the light cars were abandoned because of the smoke. Under the sidewalk in front of the garage is a gasoline tank, holding aproximately 200 gallons of gasoline. A pool of water was thrown over the tank. District chief Kantz and five hosemen on the roof of the bottling works had a narrow escape when a sudden gust of wind carried a sheet of flames across the roof behind them, cutting them off from the ladders. They fought it back with streams from their hose until the wind shifted. Such ladders as are carried by the department were inadequate in a situation like that confronting the firemen. None of them could be hoisted so that hose lines could be carried to the garage roof. High tension cables, stretched in front of the garage and adjoining buildings, made it difficult to handle long ladders. A stream from a single line of hose was kept playing over the gas tanks and buildings constantly.

Firemen Strike in Attempt to Unionize.

Dallas, Tex.—Approximately 150 of the 176 members of the Dallas city fire department went on strike because of the suspension without a hearing of 21 firemen who refused to withdraw from a newly organized firemen's union which is affiliated with the American Federation of Labor. One hundred and fifty members of the home guard were assigned to duty as firemen at various stations. After a few days the men gradually returned and asked to be reinstated, until within a week all but 25 were at work. Commissioner Winfrey told the men that they would receive the same treatment which had been accorded them previously in the department and that the events of the strike would be forgotten. He explained to the men that hereafter they would not be required to furnish their fire clothing and beds, the city having made arrangements to furnish these. Firemen said that this equipment had heretofore required an initial outlay of more than $30 each. The commissioner finally granted a hearing to the suspended men.

Difficult Fires in New York.

New York, N. Y.—One fireman was killed and several others were injured at a three-alarm fire which burned out a six-story brick theatrical warehouse, causing a loss estimated at $100,000. While members of engine company Nos. 19 and 54 were dragging hose across the first floor of the building the flooring collapsed, dropping them into the basement. All were rescued, except John W. Kocher, of engine company No. 54. When the floor fell Kocher landed in the basement, some way off from the rest of the men. The fire was discovered by a passerby in the rear of the basement. Police reserves ordered out occupants of the row of tenements on either side. In a public school, back of the warehouse, the children continued their studies after being assured there was no danger. Anxious mothers meanwhile besieged the police in their efforts to get to their children in the school building. Owing to the inflammable character of the stores, the firemen were forced to work from the outside of the building after the first floor collapsed.

All the fire apparatus in the southern part of Manhattan was called to a fire that completely destroyed a six-story loft building and tied up all traffic on an elevated line for about two hours, while firemen poured water on the blaze in a vain attempt to keep it from spreading to other loft buildings in the narrow streets. A few minutes after the first apparatus arrived flames burst on all floors of the adjoining six-story loft building, and the firemen exerted every effort to keep the blaze from spreading from that building. It was the first large fire that the new fire commissioner, Thomas J. Drennan, had come to see, and fire chief Kenlon told him that he had chosen one of the most spectacular fires in several months. In addition to seeing the pulmotors and the rescue squads working to resuscitate five firemen who had been overcome by the smoke, the new commissioner also saw a half-dozen of his firemen work rapidly in a thrilling rescue of two of their fellows who had been trapped on a fire escape at the peak of the burning building. In the rescue about six firemen engaged in a "pick-and-go" rescue, in which they had to place their ladders three times to reach the fire escape where captain John Norton and Thomas Fox of truck 20 had been trapped while they were making an examination of the condition of the roof of the building. The firemen on the fire escape tried to make their way down when they saw that their position was becoming dangerous, but the flames drove them back. They could not climb to the roof and they could not make their way to the fire escape on the adjoining building. A few minutes after they were rescued the fire escape where the two trapped firemen had been standing broke from its supports in the brick wall and fell to the ground. The damage was about $400,000.

An antiquated five-story brick building on the Brooklyn water front, used by the government as a bonded warehouse, was party destroyed by fire with a damage estimated at $500,000. After an investigation in which more than fifty employees of the warehouse were interviewed, fire marshal Brophy declared there was no indication of incendiarism. He said the blaze started from a plumber's blow torch, which was being used to thaw frozen water pipes. The building is only two blocks from the scene of the Dow Stores fire, which recently did more than $2,000,000 damage. About the same distance away is pier 22, to which the steamship Napoli is tied up. Two days before a bursting steampipe resulted in an alarm of fire. Firemen, arriving at the pier, discovered the vessel to have a large number of high explosives on board. Mayor Hylan, on learning of this, ordered the bombs removed. Rubber, tea, cocoa and hides, all government property, were stored in the building. Tenants within a block were ordered into the street. The fireboats William J. Gaynor, New Yorker and the Zophar Mills came, but the ice was so thick along the water front that the boats were unable to get near the fire until the Zophar Mills, with her battering ram bows, cut a passageway through the barrier. Thousands of persons hurried to the scene and so great did the crowd become that reserves were called from four police stations. The blaze was fought for about two hours.

Firemen to Rebuild Burned Station.

Minneapolis, Minn.—Firemen, out of a job, because their station house was burned, will rebuild engine house No. 5, burned New Year's night, according to a statement by chief Ringer. Construction work is already under way. "By using men in the department, many of whom are skilled bricklayers and carpenters, the city can save money in rebuilding the station," Ringer said. "We can replace it in this way at a cost of approximately $2,000. The plan also will afford employment to the boys thrown out of work because the station burned." The chief's plan was endorsed by the council fire committee. The committee also decided to take 48 firemen out of service March 1. The original number was 55, but seven resignations have cut it to the new figure.

Police Chief Exonerated and Reinstated.

San Antonio, Tex.—The charges of laxity in enforcing the laws against vice made against chief of police Lancaster have not been sustained and the chief has been reinstated by unanimous vote of the mayor and commissioners. Charges had been brought by a citizens' committee of five which had investigated vice conditions in the city. The chief was accused of failing to cooperate with the military and federal authorities in stamping out vice. At the same time corporation judge J. Ed Wilkins was charged with failure to assess sufficiently heavy fines against persons charged with vicious conduct. Both were suspended pending hearings. As a result of evidence submitted the commissioners found that the charges were not sustained. Mayor Bell, in discussing the case, said: "I want to express my conviction that all of the officers of the law in San Antonio and Bexar County are faithfully and earnestly endeavoring to enforce the law and clean up the city. It must be borne in mind that a most unusual condition has confronted us. The building of the cantonments, with the relatively high wages paid, demoralized the labor market. This brought many strangers to the city. The presence of soldiers from all parts of the country brought many women, and the city has expanded in a few months from one with a population of 125,000 to one of 225,000 at least. Among the soldiers sent here have been a large number of negroes, yet we have handled this situation without friction. Records show that fully five per cent of the soldiers sent here, including both black and white, were suffering with the so-called social diseases when they were drafted. The government reports now issued show a marked reduction in this condition and demonstrate to any fair-minded man whether the clean-up is actually making headway."

Fatal Fire in Insane Asylum.

Middletown, Conn.—Two lives were lost, and property estimated in value at from $250,000 to $300,000 was destroyed, when fire, starting at 4 a. m., completely gutted the south wing of the main building containing eight wards in the Connecticut Hospital for the Insane, and for a time endangered, not only the entire main building, but also the center cottage located near by. The hospital fire department, with Middletown and Hartford firemen, succeeded in confining the blaze to the south wing. The fire was discovered in an inaccessible part of an attic. Quantities of hospital equipment and other property were saved and placed under guard of the local company of the home guards on the grounds. The patients, most of whom were men, were asleep in the rooms in the building when the fire broke out. That the fire started on the top floor undoubtedly accounted for there being no loss of life.

SEWERAGE AND SANITATION

Petition for Return to Aldermanic Rule.

Superior, Wis.—Voters numbering 1,642 have signified their desire to change from the present commission form of government back to the old form of a mayor and alderman, in a petition filed with the city clerk. The petition asks for a referendum vote on the question, seeking a council of one alderman from each of the ten wards, and a mayor instead of the present board of three commissioners. The petition took four days to assemble, it containing 250 more names than necessary for a vote. The referendum will be put before the citizens at the April election.

Mayor Barred from Practicing Law.

Seattle, Wash.—Hiram C. Gill, mayor of Seattle, has been barred by the state board of bar examiners from practicing law in the state of Washington for one year. The decision was reached following a hearing of charges that the mayor allowed the law firm of Gill, Hoyt & Frye to use his name in soliciting police court business. Similar sentences were imposed by the board upon Heber B. Hoyt and Hermon S. Frye, the mayor's former partners, who were charged with soliciting legal business in violation of a state law.

Extending Officials' Powers to Those of City Manager.

Middletown, O.—Middletown will be under a modified city manager form of government during the next year at least, although no such office has been definitely designated. To city clerk John Kunz will fall duties in every way similar to those of an authorized city manager. This change resulted from the report of the committee on rules and regulation of the city commission as follows: "At all times when the city commission is not in session matters relating to the public business shall be referred directly to the clerk of the city commission and by him to the proper committee. Heads of departments shall freely confer with said clerk and file with him complaints or suggestions." The above means a decided change in the management of the city affairs. In the past there has been but one of the five commissioners on each committee and this has created a tendency on the part of each member to hesitate in interfering or making suggestions with regard to any department in charge of a fellow member. According to the new rules there will be three members on each committee, each with power equal to that of his fellow member. In the past the heads of the various parts of the city government, including police, fire department, engineer, street superintendent, etc., have made reports only when called upon by the commissioner in charge of their individual department. Under the new rules and regulations each of these heads will appear at the regular commission meeting and besides will confer with the clerk upon matters of importance coming under their jurisdiction. They will each be responsible to the three members of the department committee. It is also specified in the new rules that every commissioner must vote upon questions put before the body, unless he can offer sufficient reason to be excused by the commission as a committee of the whole.

Grove City, Pa.—The city council has amended the ordinance which created the position of "managing engineer" so as to change the title to "city superintendent." Edward Thomas has been appointed city superintendent, with duties and functions similar to those usually performed by the city manager.

Kenyon Riddle Goes from Abilene to Xenia.

Xenia, O.—At the first meeting of the new city commission, Arthur N. Whalen was made mayor and appointed Kenyon Riddle city manager. Mr. Riddle was engineer and manager of Abilene, Kans., since June, 1913, and was a member of the civil engineering firm of Riddle and Riddle. He is a graduate of the University of Kansas. It was to a large extent due to his efforts that the city manager plan received the necessary legislative sanction in the state. Mr. Riddle is one of the remaining six charter members of the City Managers Association. In his new position he will receive a salary of $3,000 a year.

Bethlehem Looking for a City Manager.

Bethlehem, Pa.—Following a resolution by the city commission, a committee, headed by mayor Johnston, is seeking a business manager for the city. It is probable that the city officials will pool part of their salaries to pay the manager adequately.

City Wants Manager.

Ocala, Fla.—The new commission-manager charter is now in effect and the mayor and commissioners are seeking a manager. The city has a population of about 6,000, and the manager will have charge of the public utilities in particular and all administrative departments in general. It is stated that the candidate should be capable of managing the water and light plants and sewer system.

MISCELLANEOUS

Court Upholds City's Bread Law.

Toledo, O.—Toledo's bread ordinance has been upheld by the court of appeals. The ordinance requires all bread to bear a label showing the weight of the loaf, and makes one pound the standard. Under the ordinace no loaf of less than a pound can be sold. On this point the ordinance was held invalid by the common pleas court. The court of appeals reversed the common pleas court, and sustained the police court, which imposed a fine on a baker. The case was carried to the higher courts to test the ordinance, and now will probably be carried to the supreme court. Attorney for the defendant said that the elimination of less than a pound loaf will work a hardship on 80 per cent of the purchasers, who have been accustomed to buying the smaller loaf.

Vote for Municipal Fuel and Ice Plants.

Oshkosh, Wis.—Out of a total vote of 2,468 cast at a special election on the question of whether the city should establish a fuel plant, 1,846 citizens voted in the affirmative and 622 in the negative, a three to one vote and a majority of 1,124 for municipal ownership. On the question of whether the city should establish an ice plant the vote was not quite so heavy, the total being 2,303, but the result was decisively in the affirmative. The figures were 1,577 for and 726 against, giving a majority of 851, or a little better than two to one in favor of the proposition. Not one of the thirteen wards returned a majority against either proposition. There was not much of a campaign waged and what little there was resulted from the efforts of members of the Oshkosh Trades and Labor council, which was instrumental in circulating the petition that caused the special election to be held. No excitement attended the election and there was little apparent public interest in its outcome. According to the ordinances: "There shall be established as soon as possible in and by the city a municipal plant or depot for the purchase, sale and supplying to the citizens of fuel at cost," and "a municipal plant and ice house for the harvesting, storing and supplying to the citizens of ice at cost." The plant and depot are to be operated and managed pursuant to regulations to be adopted by the council, and $25,000 has been authorized for each project, to be raised either by direct taxation or by the issue of bonds in the discretion of the council. One wood and coal company has already offered to sell to the city the "entire business, including real estate, equipment, etc., the price to be fixed by an appraisal."

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Police Power—Billboards.

(Fla.) City ordinance regulating the erection of billboards held not to forbid painting of signs on walls of buildings advertising legitimate business of owner or occupant. Municipality cannot prohibit use of building surface for painting thereon signs or advertisements which are neither lewd, vulgar, nor obscene. Power of municipality to regulate billboards is included in power to abate nuisances, but cannot be exercised to extent of depriving one of legitimate use of his property because it offends the aesthetic sense of others.—Anderson v. Shackelford, 76 So. 343.

Police Power—Permit to Erect Building.

(Md.) Petitioner for mandamus against mayor and city council of Baltimore to compel issuance of permit to erect building could not obtain permit to erect building for purposes set out in petition, and, after erection, use building for other purposes, without first obtaining mayor's approval.—City of Baltimore v. Scott, 101 A. 674.

Ordinance Courses—Right to Appeal.

(Mich.) The right of appeal from justices' courts in ordinance cases must find more substantial foundation than former declared legislative policy, though such policy may be of aid in cases of doubtful construction.—Crary v. Marquette Circuit Judge, 163 N. W. 905.

Permit for Altering Buildings.

(N. Y. Sup.) If express permit for alteration of building into theater in manner other than that provided by Building Code would have been ineffective, acquiescence in such alteration without permission by city authorities would also be ineffective.—Altschul v. Ludwig, 166 N. Y. S. 529.

Police Power—Building Restriction.

(La.) Ordinance of city of New Orleans which on aesthetic considerations excluded markets from certain districts to preserve them for residential purposes, and interfering with liberty or property rights of citizens, was ultra vires and invalid.—State ex rel. Blaise v. City of New Orleans, 76 So. 244.

Police Power—Abating Nuisance.

(Ala.) City has right under general police power to abate continuous nuisance, although its ordinance in reference thereto be invalid, where due notice of intention to abate is given owner.—City of Birmingham v. Graves, 76 So. 395.

Police Power—Refusal of Building Permit.

(S. D.) City commissioners cannot arbitrarily refuse building permit to one who has complied, or plans to comply, with all laws and ordinances of city in respect to building operations.—City of Mobridge v. Brown, 164 N. W. 94.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

Jan. 30-Feb. 1.—OHIO WAR ROADS CONVENTION, Columbus, O. Ohio Good Roads Federation, Ohio Engineering Society and County Commissioners' Association. Chairman, committee on arrangements, state highway commissioner Clinton Cowen.

Feb. 4.—OREGON SOCIETY OF ENGINEERS. Annual meeting, Portland, Ore. Secretary, Orrin S. Stanley.

Feb. 4-7.—AMERICAN ROAD BUILDERS' ASSOCIATION. Fifteenth annual convention, Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 20.—CAROLINA ASSOCIATION OF HIGHWAY ENGINEERS. First meeting, Chapel Hill, N. C. Secretary, N. S. Mullican, county highway engineer, Lexington, N. C.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Society of Civil Engineers.

The annual meeting which was to have been held last June, but was abandoned, was held at the United Engineering Societies' building, New York City, January 16. The proposed revision of the constitution was taken up, but was referred to the members through a letter ballot.

Prof. Arthur Newell Talbot, professor of municipal and sanitary engineering, and in charge of theoretical and applied mechanics, University of Illinois, was elected president of the society for the ensuing year. Professor Talbot was born in 1859, was graduated from the University of Illinois in 1881, was engaged in railroad work until 1885, and in 1890 was appointed to his present position. Laboratory research in the strength of materials was instituted at the university in 1890 under Prof. Talbot's direction and studies were made of built-up iron and steel members, brick and terra cotta columns, timber, paving brick and reinforced concrete. Prof. Talbot has also developed the hydraulic laboratory of the university. He is an authority on railroad engineering problems. He was president of the American Society for Testing Materials in 1913-14, and has been president of the Society for the Promotion of Engineering Education and the Illinois Society of Engineers, and vice-president of the National Association of Cement Users. He is a director of the American Railway Engineering Association and a member of the Western Society of Engineers, the American Water Works Association and the American Society of Municipal Improvements.

George H. Pegram, retiring president, delivered his presidential address.

The secretary reported a membership on January 1 of 8,590, a net gain of 598. About a thousand members are now in service.

George W. Tillson presented a final report of the committee on materials for road construction. He declared that road work was still in an experimental stage and that the report would soon be out of date. L. D. Rights presented a final report of the committee on steel columns and struts.

Other officers elected were: Vice-presidents, John F. Coleman and Nelson P. Lewis; treasurer, George W. Tillson. Directors were elected as follows: District 1, George W. Goethals and A. M. Hunt; District 4, Samuel T. Wagner; District 9, E. E. Wall; District 10, Milo S. Ketchum, and District 11, Harry Hawgood.

Ohio War Roads Convention.

Three state organizations, all concerned with highway problems, will merge their activities this year in the Ohio war roads convention in Columbus, January 30 and 31 and February 1. The trio of associations are the Ohio Good Roads Federation, the Ohio Engineering Society and the County Commissioners' Association. Cooperating with all is the State Highway Department.

The arrangements are under the direction of a committee with state highway commissioner Clinton Cowen as chairman, assisted by president D. S. Humphrey and secretary Walter A. Alsdorf, of the Ohio Good Roads Federation; president A. R. Taylor and secretary John Laylin, of the Ohio Engineering Society, and president C. M. Hunt and secretary Richard Sinclair of the County Commissioners' Association. The triple convention has the endorsement of Governor Cox.

Primarily, the conference will consider ways and means of promotion of war roads in Ohio.

New Jersey Sewage Works Association.

The next annual meeting of the New Jersey Sewage Works Association will be held at the State House at Trenton February 15.

The interesting program which has been arranged will include the following papers: "The Operation of Small Sewage Disposal Plants," by George W. Fuller, New York City; "The Difficulties Experienced and Overcome in the Operation of the Madison-Chatham Plant," by Paul Molitor, Chatham, N. J.; "The Operation Land Filters at Newton Under Winter Conditions," by Morford G. Smith, Newton, N. J., and "Sewage Disposal Plant Operation in England," by Joshua Jamison, East Rutherford, N. J.

The president of the association is John R. Downs, Bound Brook; the

(Continued on page 86)

PROBLEMS CITIES ARE STUDYING

WITH EXPERTS

STREET IMPROVEMENTS are to be made by New Berlin, O. The engineering firm of Guily & Rice is preparing new estimates on the work.

A HIGHWAY BRIDGE to cost $220,000 is to be built by Bridgeport, Conn. The engineers to prepare plans for the structure are the Strauss Bascule Bridge Company.

Sharp County, Evening Shade, Ark., is to construct about twenty miles of gravel ROADS. Plans for the work were prepared by the Parkes Engineering Company.

Leon, Kans., is to build an ELECTRIC LIGHT PLANT. Preliminary plans for the improvement have been prepared by the engineers, W. B. Rollins & Company.

Riverside, Ill., is to make extensive improvements, including PAVEMENTS, SEWERS and WATER MAINS. The engineer for the work is C. N. Roberts.

Gilmore City, Ia., contemplates the construction of a SANITARY SEWER SYSTEM. Surveys on the improvements are being made by C. H. Currie.

Holbrook, Ariz., is contemplating the improvement of its WATER SYSTEM. The city has retained the engineering firm of Olmsted & Gillelen to prepare plans.

Two reinforced CONCRETE DAMS are to built by Neodesha, Kan. The preliminary plans for the work have been drawn by the engineers, Black & Veatch.

Galena, Kans., is to improve its WATERWORKS, plans and specifications for the work having been completed by Burns & McDonnell.

Toledo, O., is to make extensive improvements to its SEWERAGE SYSTEM and to build two SEWAGE PUMPING PLANTS. The city has retained as consulting engineers the firm of Hoad & Decker.

INDUSTRIAL NEWS

Cast Iron Pipe.—Prices remain constant. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

Highway Industries Association.

The Highway Industries Association, which was formed at a meeting in Detroit last month, held a final organization meeting at the Congress hotel, in Chicago, on January 21. Before the meeting there were conferences with the Office of Public Roads, Washington, and with the highway transport committee of the Council of National Defense, and with representatives of the executive committee of the American Association of State Highway Officials.

The purposes of the meeting is to cooperate with all government agencies, both national and state: In the coordination of the highways with other transportation agencies of the country; in encouraging development of highways that will advance the economic life of the nation, and in stimulating their use in such manner as to facilitate and cheapen the transportation of food, raw materials and finished products, to the end that our highways may be of maximum service in the transportation system of the nation.

S. M. Williams, Lima, Ohio, is chairman, and S. T. Henry, Washington, secretary. The committee on organization is as follows:

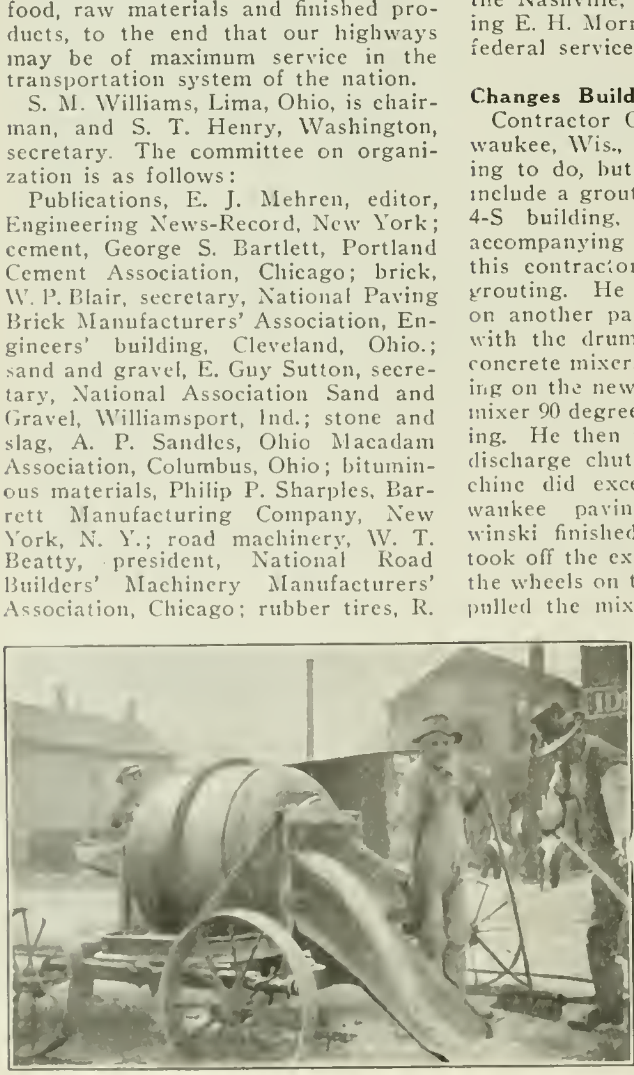
Publications, E. J. Mehren, editor, Engineering News-Record, New York; cement, George S. Bartlett, Portland Cement Association, Chicago; brick, W. P. Blair, secretary, National Paving Brick Manufacturers' Association, Engineers' building, Cleveland, Ohio.; sand and gravel, E. Guy Sutton, secretary, National Association Sand and Gravel, Williamsport, Ind.; stone and slag, A. P. Sandles, Ohio Macadam Association, Columbus, Ohio; bituminous materials, Philip P. Sharples, Barrett Manufacturing Company, New York, N. Y.; road machinery, W. T. Beatty, president, National Road Builders' Machinery Manufacturers' Association, Chicago; rubber tires, R. J. Firestone, vice-president, Firestone Tire and Rubber Company, Akron, Ohio; motor car accessories, C. W. Stiger, president, Motor and Accessory Manufacturers, Chicago; motor cars, W. P. Chrisler, general manager, the General Motors Corporation, Flint, Mich.; motor trucks, S. M. Williams, Garford Motor Truck Company, Lima, Ohio.

The United States Asphalt Refining Co., New York, N. Y., announces that C. B. Filbert, representative of the company, and also of the **Bitoslag Paving Co.,** in the state of Pennsylvania, has been commissioned captain in the Engineers Corps, National Army, and will be in the road building branch of this service.

The Goodyear Tire & Rubber Co., Akron, O., announces the following changes in branch managers: P. A. Kerns, formerly manager at Butte, Mont., has been made manager at Buffalo, N. Y.; W. J. Peete, who has been handling government business at Washington, succeeds Mr. Kerns at Butte; F. L. Morgan has been promoted from assistant manager at Philadelphia to manager of the Cleveland branch, succeeding F. N. Hammond; R. J. Davies, formerly city salesman at Jacksonville, Fla., is now manager of the Nashville, Tenn., branch, succeeding E. H. Morris, who has entered the federal service.

Changes Building Mixer to Grouter.

Contractor George Czerwinski, Milwaukee, Wis., had considerable grouting to do, but his equipment did not include a grouter. He did have a Rex 4-S building concrete mixer. The accompanying photograph shows how this contractor fixed up the Rex for grouting. He simply put the wheels on another pair of axles, set parallel with the drum, then he set the Rex concrete mixer, with its axle ends resting on the new axles. This turned the mixer 90 degrees and made it end loading. He then wired on a sheet metal discharge chute. This converted machine did excellent work on a Milwaukee paving job. When Czerwinski finished this grouting job he took off the extra set of axles and put the wheels on the stationary axles and pulled the mixer alongside a building about a mile away, where he had considerable reinforced concrete to place. The whole operation of changing this machine back to a low charging mixer he accomplished in a few minutes. The Rex mixer is made by the **Chain Belt Co.,** Milwaukee, Wis.



REX BUILDING MIXER CHANGED TO GROUTING MIXER FOR PAVING WORK.

NEWS OF THE SOCIETIES

(*Continued from page 85*)

vice-presidents are Paul Molitor, Chatham, and I. Z. Collings, Collingwood, and the secretary-treasurer is Frederick T. Parker, Atlantic City.

Minnesota Joint Engineering Board.

The annual meeting of the Minnesota Joint Engineering Board is to be held Feb. 22 at Duluth. According to its constitution, the board holds one meeting a year in which all the affiliated societies take part. The Minnesota Surveyors' and Engineers' Society is to hold its meeting at the same time and the Duluth local organization of members of the American Society of Civil Engineers will have charge of the entertainment features of the meetings.

PERSONALS

Bennett, Frank F., formerly city fire marshal of Dallas, Tex., has been appointed fire inspector by the state fire insurance commission.

Boone, Charles, has been appointed city engineer of Greenfield, Ind., for four years. He is serving his second year as surveyor and county engineer of Hancock County, Ind.

Griffiths, W. A., has been appointed county engineer of Lee County, Ia., to succeed Adrian P. Meyer, resigned.

Hoover, E. M., has been appointed commissioner of streets of Boise, Idaho, to fill the unexpired term of Thomas Finegan, who died recently.

Kennedy, T H., has resigned as fire chief of Billings, Mont.

Morse, H. S., has been appointed director of public service of Akron, O. He was since 1916 engineer of the Bureau of Municipal Research, Detroit, Mich.

Smith, E. Potter, is new police chief of Montgomery, Ala.

Smith, Frank W., formerly police inspector, has been appointed chief of police of Cleveland, O., following the resignation of William S. Rowe.

Younce, W. L., has been reappointed general superintendent of the city water and light plant, New Castle, Ind., in recognition by the council of his efficient management of the plant since 1914.

Colby, Elmer E., state highway commissioner of Oklahoma, died recently at Chickasha. He was a member of the American Society of Civil Engineers, and as government engineer laid out many towns in the state. He was at one time county engineer of Greene County, Mo., and president of the Oklahoma Society of Civil Engineers.

Municipal Journal

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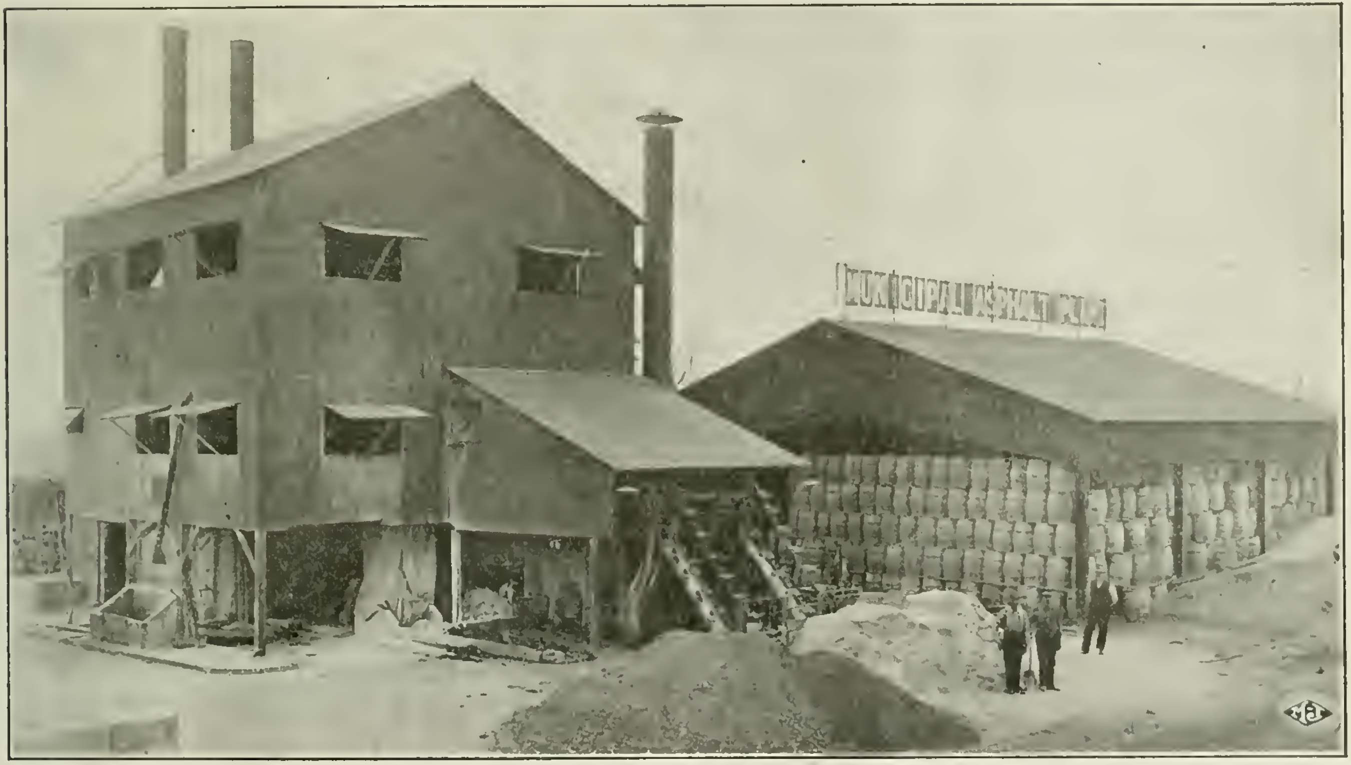
PAVING WORK IN ST. LOUIS

Review of Work Done During 1917 by the Department of Streets in Repairing Asphalt and Block Pavements—Organization of the Force—Itemized Costs—Municipal Asphalt Plant.



MUNICIPAL ASPHALT PLANT OF ST. LOUIS.

The war has not yet materially interfered with paving work being carried on by the city of St. Louis, according to preliminary figures for the calendar year 1917 obtained from the various departments of the city engineering service. The paving work carried on by the city is done mainly under the direction of two departments—the Department of the President of the Board of Public Service, which has complete jurisdiction over new construction, and the Department of Streets and Sewers, which has charge of repairs and maintenance work.

All the new construction is done by contractors and hence the Department of the President of the Board of Public Service concerns itself chiefly with the letting of contracts, supervision of the work and acceptance of the jobs when they are completed.

The repair and maintenance work of the Department of Streets and Sewers, so far as it concerns paving, is carried on by two sections, the bituminous, which looks after asphalt pavements not under contract maintenance, and the block section, which has charge of the various other types of pavement. In addition to these is the contract maintenance section, which has general supervision of all streets and alleys that are under maintenance contract.

New work done during the calendar years 1917 and 1916 is given in the table on the next page.

BLOCK PAVEMENT SECTION.

The organization of the block pavement section consists of 1 general superintendent, 2 assistant superintendents, 1 clerk, 2 inspectors, 10 foremen and 1 chauffeur. The average daily working force consists of 24 pavers, 21 rammers, 116 pavers' helpers and 27 teams.

Two material yards are maintained by this section. One, known as the Western Yard, supplies material to all crews working in the western half of the city. The other, known as the Eastern Yard, supplies materials to all crews working in the eastern half of the city. Each yard is in charge of one assistant superintendent. The crews are divided as follows:

NEW PAVING DONE DURING THE CALENDAR YEARS 1916 AND 1917.

	Miles.		Yardage.		Cost.	
	1917	1916	1917	1916	1917	1916
Streets.						
BRICK						
Improved	8.74	4.29	148,134.54	81,052.86	$473,155.30	$216,707.90
Reconstructed	0.43	1.31	9,712.94	27,025.03	38,772.86	62,148.62
ASPHALT						
Improved	1.85	1.32	51,281.04	25,045.09	128,429.38	73,101.06
Reconstructed	1.78	1.34	39,852.03	31,099.99	116,266.02	56,286.85
BITULITHIC						
Improved	1.44	0.36	22,684.74	6,336.59	74,047.79	19,952.47
WOOD BLOCK						
Improved	..	1.04	....	31,273.81	....	93,310.12
Reconstructed	0.12	0.69	2,836.78	13,993.96	7,802.01	40,089.91
TELFORD						
Improved	1.62	..	23,807.02	....	68,008.90	....
Alleys.						
BRICK						
Improved	3.41	7.18	31,117.00	73,212.31	84,831.93	151,464.14
Reconstructed	0.11	0.14	1,498.45	1,188.13	3,008.80	2,225.60
Sidewalks.						
GRANITOID						
Improved	2.24	..	7,219.56	....	15,571.26	....
Recapitulation.						
Streets	15.98	10.35	298,309.09	215 826.89	906,482.26	561,596 93
Alleys	3.52	7.32	32,615.45	73,400.44	87,840.73	153,689.74

Five crews on brick repairs, each one consisting of 1 foreman, 2 rammers, 10 pavers' helpers and 1 team.

Two crews on granite paving, each consisting of 6 pavers, 2 rammers, 6 pavers' helpers and 1 team.

Seven crews on excavations, expansions, cave-ins, leaks, granitoid work and miscellaneous repairs, each consisting of 1 paver-in-charge, 2 helpers and 1 team.

Two crews, in charge of an inspector, on limestone crossings, gutters, alleys and curbing, in the northern half of the city, each consisting of 1 paver, 2 pavers' helpers and 1 team; and a similar force for the southern half of the city.

Approximate estimates of the amount of repair work done in the calendar year 1917 by this section are as follows:

Brick paving..	49,538	square yards at	$1.00	per yard	$49.538
Granite paving	36,040	" " "	65	" "	23.426
Wood block..	14.088	" " "	1.50	" "	21,132

Some valuable cost figures have been worked out by officials of this section, covering the repair work done in the fiscal year ending March 31, 1917. They give in detail the exact cost, per yard, of various kinds of paving and curbing and are as follows:

BITUMINOUS SECTION.

The bituminous section is one of growing importance, since it is gradually taking over more and more of the work under the jurisdiction of the Contract Maintenance section, following the installation of a municipal plant a few years ago, which has been a marked success.*

The organization of this section is as follows: One engineer, as superintendent, 1 assistant superintendent, 1 plant foreman, 11 street foremen, 3 plant engineers, 4 roller engineers, 1 chauffeur, 3 clerks, 1 chemist, 1 assistant chemist, 1 blacksmith, 1 machinist, 12 asphalt rakers, 19 asphalt tampers and smoothers, 73 laborers and 23 teams.

The bituminous section last summer employed four rollers—one Erie of 5 tons, one Kelly of 5 tons, and two Kellys of 8 tons. During the summer the section worked seven asphalt repair gangs and 27 resurfacing gangs. The repair gangs generally consisted of about 8 men each, and the resurfacing gangs of from 20 to 35 men each. There were also in service 19 teams and 5 trucks, 3 of the trucks being devoted to oiling and two to hauling

COST OF REPAIR WORK DURING THE FISCAL YEAR 1916-1917.

Streets.

	Number of Sq. Yds.	Material Cost	Labor Cost	Total Cost	Material Cost Per Yard	Labor Cost Per Yard	Total Cost Per Yard
Brick	71,280	$22,366.38	$46,023.87	$68,390.25	$0.31378	$0.64568	$0.95946
Granite	36,696	3,697.04	19,298.00	22,995.84	0.10075	0.52591	0.62666
Wood Block	13 837	8,942.55	7,920.40	16,862.95	0.64627	0.57240	1.21867
Limestone	6,281	499.77	7,233.53	7,733.29	0.07956	1.15165	1.23121

Curbing.

	Number of Lin. Feet	Material Cost	Labor Cost	Total Cost	Material Cost Per Foot	Labor Cost Per Foot	Total Cost Per Foot
Granitoid Curbing..	1,755	$1,331.90	$3,715.09	$5,046.99	$0.75891	$2.11680	$2.87571
Granite Curbing....	4,524	3,723.26	1,919.08	5,642.33	0.82300	0.42419	1.24710

Excavations.

	Number of Excavations	Sq. Ft. Concrete	Sq. Ft. Paving	Cost	Amount Charged	Profit
Wood Block Excavations	85	1,074	1,799	$484.82	$467.28	......
Brick Excavations	587	15,884	22,776	4,691.42	4,752.20	$60.77
Granite Excavations	434	7,331	12,574	2,173.72	2,623.64	449.92

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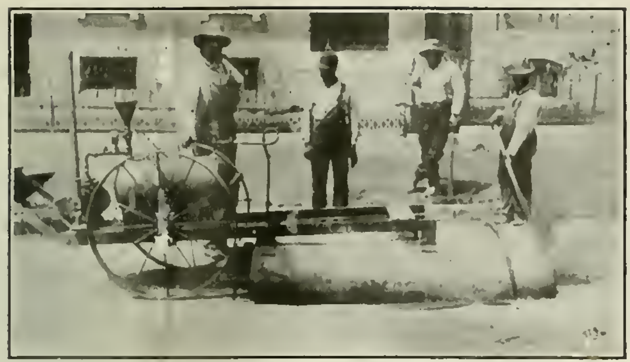
*This plant was described in the issue of Municipal Journal for Nov. 21, 1912.



PATCHING WITH ASPHALT SURFACE HEATER.

asphalt, the oiling branch being a subsidiary of this section. The trucks consist of one Mack, one Saurer and three White trucks, the three White trucks being devoted almost exclusively to oiling. One of the trucks is a 3-ton machine and the other four are of 5 tons each. The trucks have separable bodies and automatic hoists. In winter, when the oiling work ceases and the asphalt plant is closed, the trucks are used to haul snow from the streets. During the present winter, however, owing to the difficulty in getting coal for the city institutions, they have been hauling coal as well.

The plant, which has a daily capacity of 1,500 tons, is located on a spur of the Missouri Pacific railroad on the outskirts of the city. The site is 310 by 80 feet. The plant proper is a 3-story steel frame structure sheathed with 20-gauge corrugated iron. The second and third floors are of reinforced concrete slabs, 5 inches thick, which can support a weight of 250 pounds a square foot. Iron stairways connect the various floors.

On the ground floor is the drying apparatus, which consists of two 40-inch dryers. The cold sand is discharged directly into the dryers by a feed elevator. When the sand is heated, it is carried by a chain and bucket elevator to the third floor, where it is passed through a 30-inch rotary screen into a bin having a capacity of 350 cubic feet. Tailings are discharged through a spout to a bin outside the building for use later in making binder. The screen is so arranged that when it is desired to run binder, the discharge from the elevator may be let directly into the bin unscreened.

From the bin the sand passes through an orifice in the bottom, controlled by a swinging cut-off gate, into a weigh box on the second floor, which in turn discharges through a gate in front into the mixer, which is just below it.

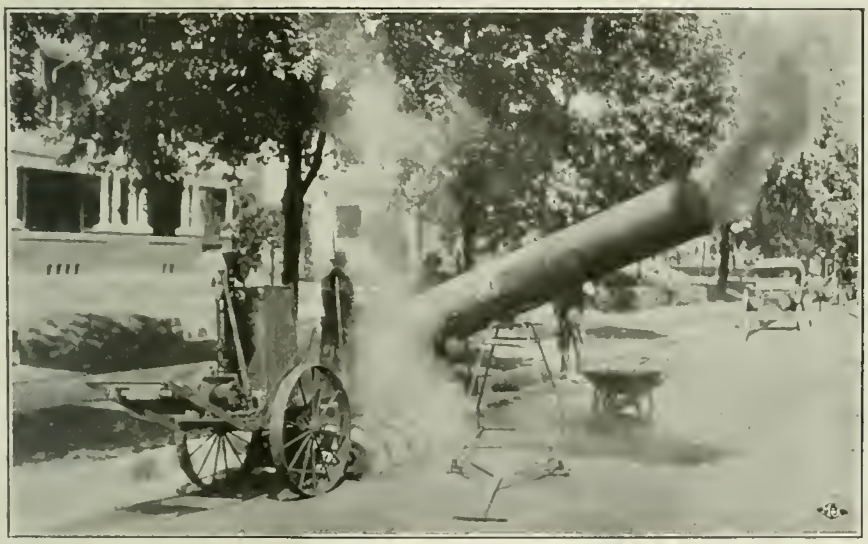
The limestone dust is carried from the ground to the third floor by a chain and bucket elevator and deposited in a storage bin having a capacity of 300 cubic feet. From the bin the dust is conveyed to the hot sand weighing box by a screen conveyor operated through a friction clutch. At the weighing box the scales for the hot sand are so arranged that the proper proportion of dust may be mixed with the sand.

The asphalt, lifted to the third floor by a 2,000-pound platform elevator driven by a 5 by 5 vertical engine, is melted and prepared in a large tank, divided into three compartments of 2,085 gallons each. Each compartment has three removable self-draining steam coils of 1¼-inch seamless pipe, the coils having a total length of 640 feet. To reduce heat losses by radiation, the outside of the tank, below the third floor, is covered with asbestos.

Agitation is supplied by either steam or air. The air is furnished by a 6 by 10 by 6-inch Clayton flywheel air compressor, with a capacity of 80 feet per minute. The compressor is operated by steam, so that compressed air may be furnished without operating the whole plant. Two 65 h. p. horizontal tubular boilers supply the steam.

The cement flows by gravity to a measuring bucket mounted on a carriage running on an overhead trackway leading from the kettles to the mixer.

Oil for the asphalt is kept in an 18,000-gallon storage tank, 9 feet in diameter by 38 inches in length, which stands in the yard. The tank is divided into compartments, each having independent heat coils, air connections, inlets and outlets. The compartments may be connected by a siphon connection or by air pressure, which also serves to elevate the oil to the 300-gallon flux weighing tank



An interesting feature of the work of the burners is a pipe attachment used to divert the smoke from trees that may line the street. The pipe is attached to the carrier with a swivel, and, as shown in the cut, is elevated or lowered as desired by means of the adjustable support. The pipes are, as a rule, 14 inches in diameter, and their length is varied to suit conditions, by adding or removing sections at will.

RESURFACING WORK BY BITUMINOUS SECTION.

which rests on a 3,000-pound platform scale on the third floor.

The mixer is constructed to mix batches of 1,000 pounds of top mixture at a time. The mixture is discharged through a sliding gate, operated by a lever, into wagons and trucks underneath, which convey it to the repair gangs.

The asphalt in barrels is stored in a shelter house which has a capacity of 400 tons. Four inverted lawn sprinklers fastened to the ceiling serve in hot weather to wet down the asphalt.

The proportions used in making the top mixture per box of approximately 1,735 pounds are as follows: Asphalt, 185 pounds; dust, 250 pounds, and sand, 1,300 pounds. One-fourth of the sand is coarse Meramec river sand and three-fourth is fine Mississippi sand. The proportions for the binder mixture, also per box, are: Asphalt, 85 pounds; stone, 1,080 pounds, and sand, 270 pounds, the sand being divided in the same manner as mentioned above. The proportions in both cases may vary slightly at times, but the above are the averages.

According to preliminary estimates compiled by superintendent Brighton, approximately 140,000 yards of asphalt paving, all repair work, were laid in the calendar year 1917. The cost in place per yard was about 85 cents, exclusive of overhead charges.

At the present time about 2,650,000 yards of surface are being maintained by the section. The cost of maintenance per yard per year is approximately 6 cents, according to the figures for 1917. This low cost, however, is attributable in part to the fact that most of the materials were purchased before the United States entered the war. In the calendar year, 1,500 tons of asphalt were used, the average cost per ton being $18.

Some interesting figures on detailed costs have been worked out covering the fiscal year from April 1, 1916 to March 31, 1917. They are as follows:

Itemized Costs of Asphalt Repair Work, 1916-1917.

	Plant Cost.			Street Cost.			Plant and Street Cost.	
Nature of Maintenance	No. of Boxes	Material Labor & Haul	Per Box	Sq. Yds. Laid.	Labor & Material	Per Sq. Yd.	Material, Fuel, Labor & Haul	Per. Sq. Yard
Pan-Patching	343	$1,351.68	$3.94	3,958	$1,518.08	$0.3835	$2,869.76	$0.7250
Plant Patching	9,471	42,659.13	4.50	105,221	27,016.46	0.2567	69,675.59	0.6621
Plant Binder	1,408	4,098.38	2.91	18,679	3,825.60	0.2048	7,923.98	0.4242
Resurfacing	4,368	19,122.85	4.38	50,437	5,697.66	0.1129	24,820.51	0.4920
Resurfacing Binder ..	3,759	10,230.37	2.72	39,037	4,487.35	0.1149	14,717.72	0.3770
Total	19,349	$77,462.41	$4.00	217,332	$42,545.15	$0.1957	$120,007.56	$0.5522

	Miscellaneous Cost.						Total Cost.	
Nature of Maintenance	Plant Repairs Labor	Plant Idle Time	Street Idle Time	Tool and Equipment Repairs	Overhead	Total	Plant, Street and Misc.	Sq. Yd.
Pan-Patching	$131.26	$34.75	$96.79	$30.57	$102.90	$396.27	$3,266.03	$0.8256
Plant Patching	3,624.53	959.40	1,374.22	843.86	2,841.30	9,643.31	79,318.90	0.7538
Plant Binder	538.81	142.63	204.29	125.44	422.40	1,433.57	9,357.55	0.5043
Resurfacing	1,671.63	442.46	633.79	389.18	1,310.40	4,447.46	29,267.97	0.5802
Resurfacing Binder..	1,438.55	380.76	545.43	334.93	1,127.70	3,827.37	18,545.09	0.4756
Total	$7,404.78	$1,960.00	$2,854.52	1,723.98	$5,804.70	$19,747.98	$139,755.54	$0.6430

The patching pans, of which there are four, are used only for emergency work, when the plant is shut down, as for the winter. Most of this work is temporary only and generally is done over again when the plant is in operation. The four pans are located at the plant and the material is transported by the usual methods to the work.

The pans in use in St. Louis were made locally and consist of concave pans of thick sheet iron mounted on brick supports. They measure, with the supports, about 4 feet by 4 feet by 20 inches, and each holds about 25 cubic feet of material, making about half a wagon load. The tops of the pans are open and the melting material is mixed by a crew of four men, using long-handled shovels.

The cost of operating the various sorts of motor trucks for the same fiscal year were as follows:

Costs of Operating Motor Trucks, 1916-1917.

	White No. 4.	White No. 5.	Mack.	Saurer.
Gasoline	$265.73	$242.73	$242.93	$225.49
Lubricants	57.48	50.48	64.78	35.84
Grease	3.58	3.06	1.08	3.57
Repairs	4.50	....	42.65	53.80
Material	140.02	75.10	36.87	227.12
Mechanic's time...	....	....	91.37	210.19
Stack	.50	.45	20.94	35.25
Total	$471.81	$371.82	$500.62	$791.26

The officials in charge of the work are: President of the Board of Public Service, E. R. Kinsey; Director of Streets and Sewers, C. M. Talbert; Street Commissioner, J. M. Slater; Superintendent of Block Pavement Section, P. H. Koncen; Engineer of Bituminous Pavement Section (and superintendent of the asphalt plant), O. S. Brighton.

REPAIRING BITUMINOUS PAVEMENTS[*]

Causes of Defects and Methods of Treating Each—Use of Hot Binders and of Cold Bituminous Mixtures.

In a paper dealing with this subject, G. H. Biles, second deputy state highway commissioner of Pennsylvania, divided the subject under the heads of "bituminous macadam pavements" and "bituminous concrete pavements." The most common deficiency in the former class of pavement is found, he said, in non-uniformity of surface. The causes of defects in such pavements he classified under six heads; and following the classification, he explained the methods of treatment which have given the best results.

The first defect consists of spots of excessive bituminous material and bare or lean areas, resulting in a ravelling or break up of the road surface. This condition is usually caused by improper distribution or by applying the bituminous material when the stone is not thoroughly dry. Such a road, if taken in time, can be repaired by sealing the dry or lean spots with a light, heated application of bituminous cement of the binder grade, or with cold bituminous surface treatment materials in quantities ranging from 1/10 gal. to 3/10 gal. per square yard, and covering with chips or pea gravel, using between 15 and 20 pounds to the square yard. Unless the surface is badly worn, such repairs will even it up to a true cross section and add to the life of the pavement.

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[*] Abstract from a paper presented before Section D of the American Association for the Advancement of Science, by Geo. H. Biles, Second Deputy State Highway Commissioner of Pennsylvania.

The second condition is a rough surface, the stone loosened or ravelled and the binder showing rapid deterioration, generally resulting in a series of pot holes. This may be caused by improper or over heated bituminous material, unsatisfactory aggregates, or faulty drainage. Such a condition calls for heroic treatment, complete scarifying and harrowing of the surface being necessary if it covers a considerable area. All disintegrating material must be removed and sufficient new stone added to give the required depth before applying the bituminous material. If the defects are found in only occasional small areas, however, they may be cut out, cleaned thoroughly and filled with new stone, compacted and then penetrated as in case 1. If drainage conditions are responsible they must be corrected before any surface repairs are begun.

The third condition is that of a surface apparently lifeless, but in which bituminous binder with life is found at a slight depth below the surface. In many cases this has been caused by insufficiency of bituminous material. The least expensive remedy is to fill the surface voids with a bituminous material that will penetrate and enliven the old material, and cover with good, hard stone chips, using about 20 pounds to the square yard. An alternative method is to thoroughly clean and then scarify and harrow the entire surface, supplying additional new stone if this appears to be necessary to give the proper cross section, roll the pavement and penetrate with a bituminous binder as in original construction. If the bitumen in the old pavement does not possess life, however, this method is a hazard.

The fourth case is that of a wavy and uneven surface, which is usually due to an excess of bituminous material, or the use of material too soft for the traffic. The most economical and satisfactory remedy is generally to scarify and reshape the surface. If the condition was caused by a too soft binder, it is necessary to add considerable stone and incorporate a harder binder than was used in the original construction. If there are only occasional waves in the surface, these may be cut off and the exposed surface resealed, or the depressions may be cut out and replaced with new material.

Fifth—Ridges may be caused by irregular or improper pouring, in most cases careless hand pouring. Such a surface suffers quickly from traffic and the elements and disintegrates rapidly. If the defect is not too pronounced the surface may be evened up by painting between the ridges with bituminous cement and covering with stone chips or gravel; continuing this treatment from time to time until the surface is entirely evened up. Or the surface may be scarified (with the object of more uniformly distributing the old bituminous material) and, after rolling to a proper shape, given a surface treatment of cold bituminous material that will enliven the existing material and seal the surface, covering with stone chips as in regular surface treatment work.

Sixth—A fairly well shaped, uniform surface may become porous, which occurs to all bituminous highways in time as it represents the beginning of deterioration of the bituminous material. The old bitumen can be enlivened or revived by cleaning the surface and applying a seal coat of material in quantities depending upon the degree of disintegration. An excessive amount will result in a slippery condition very objectionable to horse-drawn traffic. Usually 1/10 to 1/6 gallon is used and brushed into the surface with hand brooms and about 20 pounds of chips or gravel to the square yard is applied. Some slowly drying cold bituminous materials soften up the old bitumen somewhat and at first give the appearance of an excessive application, which condition, however, disappears after a short period. To insure the best results, one-half of the road should be treated at a time in order that the traffic may use the other half while the bituminous material is setting up. This method has proved quite effective and resulted in increased life of the pavement.

In repairing small local defects, it is more satisfactory to use hot bituminous binders, and if replacements are necessary they can be made after the fashion of the original construction. Cold bituminous compounds have been used successfully in certain seasons of the year, but in cold weather there is usually difficulty with some of this material owing to its composition. In some cases the emulsified products break down or separate and their adhesiveness is destroyed at low temperature. Materials that are cut back with natural solvents can be used later and give very good results. The mixtures can be prepared at some point not exposed to the weather but convenient to the work, to be used as needed. This is an effective method in case of emergency.

BITUMINOUS CONCRETE.

Cracking is one of the most common and earliest defects appearing in bituminous concrete pavements. Such cracks may occur immediately above cracks in the base caused by contraction, or because the pavement does not receive sufficient traffic to iron out and close up the surface after low temperatures have caused contraction cracks.

The bituminous mixtures expected to receive heavy traffic should be tough and fairly hard in order to resist displacement, while those designed for light traffic should be made softer and more yielding by using softer bitumen. Pavements containing hard or non-ductile bituminous material have a greater tendency to crack than those made with softer bitumen. Cracking and even general disintegration may result from the use of too little bitumen, or from overheating the bitumen, which reduces its bonding power.

Cracks, unless caused by some serious form of disintegration, can be repaired by cleaning them out thoroughly and pouring them full of hot or cold bituminous mixture of the proper grade and then tamping or wedging stone chips into the cracks, thoroughly sealing it. If the crack is wide and the edges have crumbled or broken off, they should be cut down evenly and the opening filled and tamped with a mixture of one part bituminous cement to nine parts of chips, in sufficient quantity to completely close the crack.

A bituminous concrete satisfactory in all other respects may show surface indications of slight disintegration; the gloss is gone and the surface approaches a light brownish hue. This is speedily followed by a general porous condition which, if not promptly corrected, will allow the surface to retain moisture which will break the bond, causing ravelling and failure of the pavement. If the entire surface is cracked and generally bad and if gradually crumbling away due to disintegration, the surface must be entirely replaced with a new one. If this condition develops locally into pot holes or depressions, these can be repaired by cutting out the defective areas down to the foundation and replacing with a new mixture. A bituminous concrete pavement which begins to have a dry, porous appearance can be revived with a light bituminous surface application as in the case of bituminous macadam.

A wavy surface is generally caused by the bituminous mixture being too soft and pushing under traffic. It may result from using material during construction that was not at a temperature suitable for raking to a uniformly loose condition, or to creeping during rolling resulting from careless handling or from being rolled while too hot. Pushing or waving in local spots may often be traced to the laying of the mixture on a dirty surface. A wavy irregular surface is in most cases positive proof of the inability of the pavement to meet the traffic conditions, except when it results from faulty methods of construction. If the materials were inadequate for the traffic and irregularity of surface steadily increases, reconstruction will eventually be necessary. If irregularities were caused by careless methods of spreading, beneficial results can be obtained by rolling the surface in hot weather with a tandem power roller.

Wearing and deteriorating along the edges of the pavement where there is no header necessitates some of the most troublesome and expensive forms of repair required by roads of this type. Moisture in the shoulders and foreign materials tracked from them onto the pavement are largely responsible. This is specially pronounced when the material in the shoulders is of a non-porous nature, the moisture in the shoulders attacking the bituminous material. When the edges of the pavement break down, the first and most essential necessity is to correct the cause, providing adequate drainage to the shoulders if this is necessary and, if they are composed of non-porous material, cutting small surface ditches at intervals of about 20 feet and replacing the material immediately along the edge of the pavement and for a depth of a few inches with broken stone or gravel tamped into place.

Unless the repair work is extensive, it is not advisable to use hot bituminous compounds, cold cement being more convenient and economical if the proper mixture is used in the regular working season. Hot bituminous repairs are not generally satisfactory when made at low temperatures, but Mr. Biles believes that it is better to patch with bituminous materials even in cold weather than to use bricks or stone blocks for this purpose, as is done in some cities; since the latter is annoying to traffic and, when the regular repairing season arrives, it will usually be found that the area needing repairs has been considerably enlarged. Some advocates of brick or stone block repairs claim that that method insures that the affected portions will not be overlooked when repair work is taken up in the spring.

Where there is enough yardage to warrant a central mixing plant, this is the most satisfactory method of handling bituminous repairs, as more uniformity in mixing is assured. In most cases, however, the work must be done by a small town having a few streets to maintain, and for such the author believes that the cold bituminous mixture method with the proper materials is the most economical and fool-proof method for ordinary repairs. Repairs have been made with such method on extremely heavy travelled roads that are in excellent condition after four seasons of wear. Trained men have prepared good hot bituminous mixtures by hand, but considering the chances taken of overheating the material, carelessly mixing it, and the extra expense connected with handling the equipment, this method does not seem to be justified.

STATE HIGHWAY WORK IN PENNSYLVANIA.

State highway commissioner J. Denny O'Neil has stated that work on the Pennsylvania State Highways will proceed this year with greater vigor than ever. The work will be done by contract and the high prices of materials will not cause a decrease in amount done. If, however, bids for any piece of work are considered by the engineers to be too high, they will be thrown out and new bids advertised for.

The commissioner realizes that maintenance will be the important feature this year, as the unprecedented heavy trucking which will undoubtedly pass over the main arteries of the state will try the durability of the roads and necessitate continuous maintenance of the highest character. Fortunately, the state will have more money for maintenance than in previous years and the Highway Department plans to make every effort to use it to aid the government in solving the transportation problem.

STREET REPAIRS IN COLUMBUS, OHIO

Lessons from Several Years' Experience in Maintaining and Repairing Various Classes of Pavement—Work Done by Municipal Asphalt Plant.

By CHARLES CARROLL BROWN.

While the city of Columbus, O., does not publish reports of the operations of all its city departments, reports are made by some officials in considerable detail and are on file so that they can be made use of by those interested. The reports of street repairs, made by the Department of Street Repairs under the charge of Thos. H. Brannan, superintendent of asphalt repairs and of the municipal asphalt plant, are particularly full and comprehensive and a study of them gives many pointers as to methods and cost which should be valuable to other cities.

ASPHALT.

The city operates a Hetherington and Berner asphalt plant of good design and proper capacity during a part of each season in repairing asphalt streets with standard asphalt mixtures and, in case of very old streets, with bituminous macadam. The plant also supplies materials for covering old brick and stone block pavements with two-course asphalt paving and does a considerable amount of repair work for street railway, water and sewer departments and plumbers, for which definite charges are made, large enough to cover all expense, including interest and depreciation on plant and tools. The street rollers belonging to the department are also rented at prices which probably are sufficient to cover all charges, though there is not much leeway.

Asphalt streets are usually repaired with asphalt and require little special description. Repairs are kept up from year to year, so that there is little variation in yardage of repairs. Thus on 23 streets with a total area of 142,737 sq. yds., for which figures are available for six years, the total yardage of repairs was 9,254 in 1911, 13,135 in 1912, 12,690 in 1913, 8,433 in 1914, 5,904 in 1915 and 13,209 in 1916. All of these streets were 21 to 28 years old at the beginning of 1916, except one which was 15 years old. The increase in cost due to increase in price of materials and labor is shown by the average cost of the asphalt repairs for the 5 years, 1911 to 1915, being $1.03 per yard actually repaired, while it was $1.14 for 1916. Computed for the total area of the street, the cost for asphalt repairs for the 5 years 1911 to 1915 averaged 7 cents per square yard per year. Taking the asphalt streets of the same list which were repaired with asphalt in 1916, the average cost per square yard per year was 5.47 cents. Some of the older streets were repaired with asphaltic concrete, but as the cost of the asphaltic concrete was 85 cents per square yard as compared with the $1.14 for asphalt, above given, the actual average cost of repairs of the same 23 streets was 95.1 cents per square yard of actual repairs, but, computed on the total area of the streets repaired, the cost was 8.44 cents per square yard per year.

This high cost per square yard of total area was due to the heavy bill for repairing one street with asphaltic concrete, 20 cents per square yard of its total area. If this street is omitted, the average cost of repaving the others is 5.9 per square yard for 1916. A double street-car track, heavy traffic, a crushed stone foundation, an age of 21 years, and no repair cost in 1915, are the reasons for the high cost in 1916 on this one street. However, in the 4 years 1911-1914, 64 per cent of its area had been repaired with asphalt, or an average of 16 per cent each year and, although no repairs were made in 1915, not more than 21.6 per cent of its area was repaired in 1916.

Effect of Foundation on Asphalt Repairs.—The effect of foundations on the cost of asphalt repairs is shown by classifying repairs on this basis. The results given are averages for the 5 years 1911-1915.

Three streets had been re-surfaced with asphalt wearing surface and no binder course over old brick pavements. The repairs cost $1.19 a square yard as made. In 5 years 53 per cent of the area had been resurfaced, or an average of 10.6 per cent a year, and the cost per square yard per year was 12.65 cents. The age of the resurfacing was not given.

Four streets were of asphalt or crushed stone base. The repairs cost $1 a square yard as made. In 5 years 53 per cent of the area had been resurfaced or an average of 10.6 per cent a year and the cost per square yard per year was 10.57 cents. The per cent of the area repaired varied from 22 to 64 per cent. The average age of the 4 streets was 22¾ years, ranging from 15 to 28.

Eight streets were of asphalt on old cobble-stone base. The repairs cost $1.05 a square yard as made. In 5 years 32 per cent of the area had been resurfaced, or an average of 6.4 per cent a year, and the cost per square yard per year was 6.33 cents. The area covered by the repairs in the 5 years averaged from 18 per cent in a street 28 years old to 42 in one 25 years old. The average age of the 7 streets given was 24 years, ranging from 19 to 28 years.

Eight streets had concrete base. Repairs cost $1.06 per square yard as made. In 5 years 25 per cent of the area had been resurfaced or an average of 5 per cent a year and the cost per square yard per year was 5.4 cents. The area covered by the repairs in 5 years ranged from 14 per cent in a street 26 years old to 32 per cent in one of the same age, with one 22 years old of 66 per cent. The average age of 7 streets given was 25 years, the range from 22 to 27 years.

The collection of these figures in the accompanying table shows the value of good foundations, the smaller area of repairs and lower cost being evident in every case. The only exception is in brick pavements resurfaced with asphalt. The better condition of brick streets resurfaced in later years with two-course asphalt paving is evidence that the higher cost of repair of asphalt over old brick in the table is due to the lack of binder in the surfacing and not to the brick base.

It will be noted also that the age of the pavements is greater as the percentage of area repaired is less. For pavements of the same age, therefore, the lower costs of repairs over the better foundations would be even more pronounced than those shown in the table.

ASPHALT STREET REPAIRS IN COLUMBUS, O.

Kind of Foundation	Brick No Binder	Broken Stone	Cobble Stone	Concrete
Number of streets	3	4	8	8
Age, range, years	..	15-28	19-28	22-27
Age, average, years	..	22.75	24	25
Cost per sq. yd., laid	$1.19	$1.00	$1.05	$1.06
Percentage of area resurfaced per year, average for 5 years	10.6	10.6	6.4	5.0
Cost per square yard of total pavement per year, cents	12.65	10.57	6.33	5.40

Special Conditions.—One street of Bermudez asphalt nearly 3 miles long laid 11 years ago has had no repairs except from cuts for pipes and conduits. The central 52 feet of two blocks opposite the State House is of asphalt on concrete base and 14 feet on each side is of old granite blocks with cement filler which is used for parking space for automobiles. At one end of this portion of the street the slope of the intersecting street is so great that the crown of this street is thrown to one side. The crown runs 167 feet diagonally until it reaches the center of the street and thence keeps its place in the center of the street. The warped surface resulting is so smoothly worked out that the peculiarity of the design is almost unnoticed.

One street of Trinidad asphalt on an old cobble stone base is about 15 years old and has required no repairs except for pipe cuts. The softness of the mixture is probably responsible for the durability of this street.

A Kentucky rock asphalt street now about 28 years old has had light traffic and has worn down until it is not more than ½ inch thick. Probably 75 per cent of the area of the street has been patched, 20 per cent in the 5 years 1911-1915 or 4 per cent a year, and but little more than 2 per cent in 1916.

ASPHALTIC CONCRETE.

In 1916 asphalt concrete was used for repairing eleven streets, as compared with 29 repaired with asphalt, including 2 repaired partly with each. The age of 6 of the streets repaired with asphalt cement is given and averages 24 years, ranging from 21 to 27 years. The area covered by the repairs on the 11 streets ranges from 35 to 5,419 square yards.

The asphalt cement was used on streets nearing the time of entire resurfacing, because this material will last fully as long as the old asphalt still in place and costs 85 cents a square yard as compared with $1.14 for asphalt. If interest on the investment at 4 per cent be added the costs becomes 91 cents and $1.22 cents respectively. Again, old streets can be kept in repair in the summer with the regular asphalt mixture, but when breaks occur in cold weather, which must be repaired to carry the streets through the winter, the regular asphalt repairs are liable to break up and not last through the winter, while the asphaltic cement keeps its place better under such conditions. There is not much of this sort of work required but, when required, the asphaltic cement is preferred for making these patches.

Wadsworth Kentucky rock asphalt used on a wide driveway with very light traffic, ¾-inch of the asphalt mixture being rolled into a layer of broken stone, is in satisfactory condition after two years of use while a thin coat of the Kentucky asphalt on concrete in another portion of the same driveway does not keep its place, many bare spots showing after a year or two of use. A more heavily traveled driveway of bituminous concrete, Topeka mix, in the same vicinity is in good condition after a year of use, some disintegration of a few soft stones being the only evidence of disintegration.

RESURFACING BLOCK PAVEMENTS WITH ASPHALT.

As an improvement on the resurfacing of old brick and stone block streets with asphalt, omitting the binder course, noted in the table above, several streets have been resurfaced within the last four or five years, using the regular asphalt construction with cushion or binder coat and wearing surface. None of these has required repair as yet. The methods of construction and of design so as to take care of the surface drainage are described in a paper by Mr. Brannan presented to the American Society of Municipal Improvements in 1916. The designs vary according to the local conditions, but in practically every case the result seems to be the same as for new concrete base. The repair costs on these streets, when it begins, will doubtless compare with those given in the above table for asphalt or concrete base.

BRICK.

The patching of brick streets was divided into six districts, each in charge of a foreman. The number of patches made by the six gangs in 1916 was 1,780, aggregating 9,385 sq. yd. or 5.3 sq. yd. to each patch. The labor cost was $5,955.10, or 63.45 cents per square yard.

Two of these foremen repaired 37 patches in Hayden block streets with total yardage of 457.5 and cost of $314.77, making an average cost of 68.8 cents. (The Hayden block is a special form with depressions on the surface to give foothold for horses and all streets with Hayden blocks have been in use for many years.)

The average cost per square yard of work done by the various foremen varied from 46.3 cents to 69.9 cents for brick streets and 60 to 95 cents for Hayden block.

These foremen did not do quite all the brick repairing, as the total number of patches made in 1916 was 2,267, aggregating an area of 9,747 sq. yd., with a labor cost of $6,393.98, averaging 65.6 cents a square yard.

The materials used in making the repairs included 26,097 new brick, costing $458.32, or an average of $17.60 per thousand. Standard paving cost $16.50, and old style $18.25. 88,672 old brick were reused, 4,663 old block and 3,045 Hayden block. There were also used pitch at $9.15 a ton, sand at 85 cents a ton, tools, etc., the total cost of materials used in patching brick streets being $1,775.49.

This makes the total cost of patches, including materials and labor, $8,169.47, or 83.8 cents per square yard. To this cost must be added a proportion of the office salaries.

Some old brick and stone block streets, badly worn and very rough, which should be renewed, were patched with bituminous macadam. The yardage covered was so irregular, especially as to thickness, that it is not given. 190.85 tons of macadam stone were used, costing $148.95; 3,650 gal. asphalt binder, 1,462 gal. of Tarvia X and 95 gal. K. P. Tarvia, costing all together $394.50. The labor of applying cost $642.14, making a total of $1,185.59. If the average depth of the bituminous covering is assumed as 4 inches, this material would cover about 1,200 sq yd. and the average cost would be about $1 a square yard, nearly the same as that for the same material used in patching old asphalt streets.

The total areas of the streets repaired are not given, so that no figures based on these total areas are available. Age of streets is not given.

(To be continued)

LAYING LARGE PIPES IN TUNNEL.

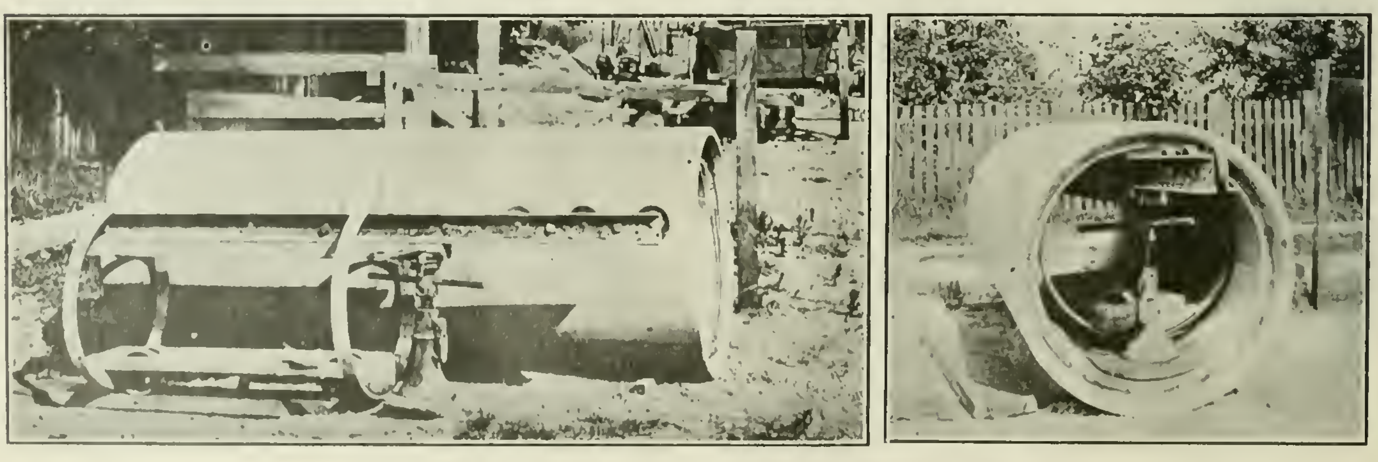
In laying heavy reinforced concrete pipes for sewer in tunnel in Vancouver, B. C., difficulty was found in setting the pipes and holding them to grade while the tunnel filling was being packed around them, because of the impossibility of lifting them from above, as is done in the case of laying such pipes in open trench. In order to overcome this difficulty, the special contrivance was designed which is shown in the accompanying illustrations. The pipes for which this was used were 30-inch lock-joint reinforced pipes weighing about 1,700 pounds each.

The contrivance consists of a carriage made of a top beam, two rings of angle iron about 28½ inches in diameter, and a small truck or platform supported by four wheels. This truck is at the bottom and supports the rings, and these in turn support the top beam. This beam consists of two 8-foot channels bolted together with a space between, in which space or slot are set three rollors near one end. A plank is fastened to the top of this beam with its top surface shaped to fit the inside of the pipe, and another plank to the bottom of the beam. The tops of the three rollers are in line with the top of the upper plank. In addition, there is an ordinary screw-jack, to the bottom of which is fitted a piece of hard wood shaped on the bottom to fit the inner surface of the pipe and supporting the jack inside the pipe.

The first pipe having been set and held in place by concrete packed under and around it, the carriage is run into this pipe, rolling on the wheels of the bottom truck, leaving about three feet of the top beam projecting. The jack is then placed inside the pipe near the forward end and by it the projecting beam or "horn" is raised to contact with the top of the pipe. Another length of pipe is brought through the tunnel into place on a small truck and is slid onto the "horn" over the rollers until it makes a close contact with the preceding pipe. As it hangs from the "horn," it can be raised or lowered to the exact position desired by turning the screw-jack. When adjusted exactly to line and grade, it is held suspended in this position while concrete is packed between the pipe and the bottom of the tunnel, and the joint between the two pipes is made. When the pipe has thus been solidly fixed in place, the jack head is lowered and the jack and carriage moved forward ready to lay the next length of pipe.

The jack is removed, but not necessarily the carriage, when it is necessary to admit a workman into the pipe to finish off the inside of the joints.

A. G. Dalzell, engineer of sewers at Vancouver, states that with this apparatus about 2,000 feet of 30-inch pipe has been laid in tunnel, and it has proved a great saver of both time and labor.



CONTRIVANCE FOR SETTING HEAVY SEWER PIPE IN TUNNEL.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PROSPECTS FOR ROAD WORK.

About a week ago Buchanan county, Missouri, voted in the ratio of five to one in favor of a two-million-dollar bond issue for the construction of hard-surface highways; and it is reported that several other counties of the state are preparing to vote on similar programs. Voting bonds is not equivalent to selling them, of course; and even letting the contracts is not assurance that the roads will be built in these embargo times. But it shows that the people of one section of the country, at least, are in favor of building roads on a large scale in spite of the higher prices that will probably prevail. Casual inspection of recent issues of Municipal Journal, moreover, shows millions of dollars are to be spent by each of a considerable number of states, from California to Florida, including six or seven millions in Michigan.

As to contracting for paving work, our reports for the month just past show an average of twenty-five or more contracts a week definitely let—a good showing for so early in the season, the spring lettings generally numbering many times as great as the winter ones. Some of the contracts already let are for hundreds of thousands of dollars.

There is still doubt as to the conditions under which this work must be done. The priority order withholding all open freight cars from use for carrying road materials will not be in force, but preference will undoubtedly be given to coal, food and munitions for many weeks to come. There are indications, however, that several of the bureaus and officials at Washington are in favor of a road-building program of more than usual extent—accenting the word program. Logan Waller Page, director of the Office of Public Roads, has urged all the state highway departments to prepare a program listing each road in the order of its economic importance. If Secretary McAdoo (who will control the railway transportation of road materials, and possibly the issuing of bonds for road work as well) is convinced that the road work that it is desired to undertake all fits into a plan carefully considered with a view to increasing the transportation facilities of the country, it is difficult to believe that he will impose any obstacles to the carrying out of such plan.

But we believe that a plan or program will be insisted upon, and properly so. Building a stretch of road here and another there, each with no relation to the other or to any road system but chiefly to please the largest percentage of tax payers, as has so often been the practice, has no place in a country and a time in which every energy is being directed to rushing war preparations. Men, material or money used in such work is worse than wasted. On the other hand, road construction that furnishes continuous routes of good, hard-surface roads between traffic centers may easily double the traffic facilities of the country now furnished chiefly by the greatly over-burdened railroads.

The American Road Builders' Association, which meets in St. Louis next week, expects to discuss several papers dealing with topics bearing upon this subject, one of the most suggestive of the titles being "How to Lay Out and Justify a Program for War Roads." It is to be hoped that every state highway department will be represented at the convention, and that each representative will take home with him a determination to have a war road program adopted for his state and definite ideas as to how to prepare such a program; also that such arguments and influences may emanate from the convention at this, which would seem to be the psychological moment, as will secure for the several state programs the cooperation rather than the opposition of all Federal departments and officials.

KEEP THE ROADS OPEN.

There are still sections of the country (although they are not so numerous or extensive as formerly) where hub-deep, stiff clay mud in the roads is considered a dispensation of providence for which no road officials, state, county or town, hold themselves responsible, but farmers and other users must make the best of it, which often means abandoning all use of the road until it dries out. Such a condition is now considered a mark of deferred civilization.

But there are other roads in quite progressive communities which nature is permitted to render equally impassable to modern vehicles for days or weeks at a time because of snow too deep for wheels. If it is the duty of road officials or a road department to so maintain a road that it is not rendered impassable by mud, why is it not equally important that it be opened up after every snow storm and kept passable for trucks or other vehicles that need to use it?

Last week Michigan officials decided that the main roads in that state should be made passable at once and kept so, the attorney-general stating that the War Preparedness Board would pay at least half of the cost, the balance presumably to be borne by the counties. The meeting at which this was decided was called at Detroit by state highway commissioner Frank Rogers, because of the serious consequences to manufacturers of present conditions. On account of railroad freight congestion, auto manufacturers during the last few months have been delivering their cars overland. The heavy snows have rendered the roads almost impassable and one manufacturer stated that he would be compelled to close temporarily his plant, where 1,700 men are employed, unless the highways upon which he relied were made passable within a very few days.

There is a country-wide movement to use roads and motor trucks for freight hauling, the amount of which exceeds the capacity of the railroads. If freight routes are established in the development of this idea, provision must be made for keeping such routes open winter as well as summer; for interruption of this service, once it has become established, will be as serious as that of the railroad freight service, and readers of the daily papers do not need to be told how serious a matter even partial interruption of that has been this winter.

This would seem to us to be an important duty of the highway department, state, county or local, as a part of its road maintenance. Whether or not maintenance funds could be used legally for this purpose we can not say; but if they can not, then the laws governing their expenditure should be changed to permit of such use. The danger to the road itself of ruts in the ice and snow covering it, and the periodic use of snow plows or scrapers to fill such ruts, were discussed by us a few weeks ago, and furnish an additional argument for including the cost of snow work in the maintenance budget.

COLD-WEATHER CONSTRUCTION OF CONCRETE ROADS.

Early spring (which will soon be here) and late fall are critical seasons for concrete pavements because of the danger that low temperature may damage them. A single freezing is not believed to be so injurious as several alternate freezings and thawings, and for this reason, and because during mid-winter there is less probability that such work will be undertaken, warnings against winter work are not so necessary. Prof. Duff A. Abrams, of Lewis Institute, Chicago, has given in the organ of the Portland Cement Association suggestions for constructing concrete roads when the temperature may occasionally fall below freezing, which are summarized below:

Concrete laid in cold weather should set rapidly in order to resist safely the destructive action of freezing, and aggregate containing dirt, especially organic impurities, will produce slow setting and weak concrete. Too much water also reduces strength and prolongs time of setting and furnishes surplus moisure for freezing in the body of the concrete. Use of frozen lumps of aggregate must be avoided. It is a good plan to heat piles of aggregate by steam from a road roller, which will be facilitated by covering the piles with canvas. Heating the mixing water gives valuable results at little expense. This can best be accomplished by inserting an improvised steam coil in the water pipe near the mixer, which coil is heated by a coal or wood fire.

If it is probable that the temperature will fall below freezing while the concrete is setting, the heat generated by the chemical reaction of setting should be retained. This may be accomplished by placing a covering of canvas or other material over the newly-laid concrete so as to leave an air space between the canvas and the concrete. If there is an extreme drop in temperature, pipes carrying live steam may be run under the canvas. When the concrete has partially hardened, straw or manure may be used to protect it, but the latter should not be placed in direct contact with the concrete because of the possible injury and discoloration that may result.

As concrete exposed to cold attains strength slowly, traffic should be excluded from concrete roads finished at low temperature, it being good practice to disregard, in estimating the setting time, each day during which the thermometer falls below freezing.

Of all chemicals used, calcium chloride and common salt probably give the best results. The former lowers the freezing point of the water, accelerates the setting of cement, and causes the generation of heat due to chemical reaction. If used to the extent of about three per cent by weight of the mixing water, it will enable concrete to be placed with the temperature several degrees below freezing with little danger of injury. It comes in crystal form and is readily soluble in water. Prof. Abrams suggests making a solution of 1½ pounds of calcium chloride per gallon of water and adding one gallon of this solution for each sack of cement used. The use of this material adds about three cents per square yard to the cost of the concrete.

Common salt lowers the freezing point of water, but does not compare favorably with calcium chloride in other respects. When used in quantities of about five per cent by weight of the mixing water, it has been found to prevent freezing at temperatures not lower than 28° Fahr. Its low cost is its principal advantage.

The writer recommends the above precautions in the order given. Heating the mixing water should not be relied upon to counteract the bad effects of dirty or poorly graded aggregates or excessive amounts of water. Generally the heating of concrete materials and protection of fresh concrete will be found most satisfactory. It is not usually desirable to rely solely upon the use of chemical compounds, but these should be used only in combination with the other precautions described.

ENGINEERING FOR DIRT ROADS.

The city engineer of Hutchinson, Kansas, in a paper before the Kansas Engineering Society, expressed his convictions of the value of care in locating and grading dirt roads. To illustrate, he cited the fact that last year he had been called upon to pave with brick a dirt road that he had constructed four years previous. He said that, in building this dirt road, "I ran levels over it, platted a profile and laid a grade line as carefully as if it were for a pavement; then set stakes and saw to it that the grading gang complied with the stakes for both line and grade, although I did not dream of ever paving it. But when that time did come all I had to do was to get the old profile out of the files, set stakes according to it, fill the chuck-holes and smooth it up a bit. We had a good solid foundation for the pavement, as it had been packed with several years of traffic and rain which packed it better than a heavy steam roller would do it. The cost of the engineering work done for the grading was probably five dollars, but it probably saved about $500 worth of excavating.

"We often hear the statement made that all the money spent in building and maintaining dirt roads is wasted. If such roads are not built to the exact line and grade of the pavement that is bound to come on our principal roads soon, that statement is correct; but, on the other hand, a more far-sighted policy should be adopted and the highway engineer be permitted and required to make a definite and final location of the center line of the earth road, to run levels over it and plat a profile, then carefully lay a grade line suitable for pavement; to use vertical curves instead of abrupt changes of grade and to provide for the drainage of the side ditches as well as the roadway.

"If there is a deep ravine extending across the road, he should put in a concrete culvert and make the fill necessary to bring the roadway up to the suitable height for a paved road, because several years' settling will do a ten-foot fill a lot of good, and a pavement laid on such an old fill will not crack from settlement.

"The highway engineer should have engineer assistants enough that he could keep an instrument man on the job to set stakes to the predetermined line and grade, and see that they are complied with.

"If this is done, the money spent on the construction of dirt roads will not be wasted, but will be invested in a foundation and sub-base for the ultimate hard surface."

The WEEK'S NEWS

Los Angeles Municipal Asphalt Plant—Washington Counties' Standardized Road Accounting—U. S. Public Health Service Seeks State Cooperation on Disease Control—Cleveland's Sewage Disposal Situation—Water-Waste Survey in Buffalo—Metering Cincinnati—New Orleans Raises Water Rates—New Hydro-Electric Development for Seattle—Port Newark Terminal Swept by Big Fire—Two Platoons in St. Paul—Waltham's New City Manager—Toronto Wants Municipal Railways—Jitneys in Portland, Ore.

ROADS AND PAVEMENTS

Los Angeles Paving Plant Profitable.

Los Angeles, Cal.—In reviewing the work of the city's municipal asphalt plant, the city engineer has made the following statement: "The municipal asphalt plant has been in operation since April, 1915. Since that date there has been produced 709,860 cubic feet of standard asphalt wearing surface at an average of 13.57 cents per foot, 16,240 cubic feet of bitulithic mixture at a cost of 11.57 cents per foot, and 29,230 cubic feet of binder mixture at a cost of 10.40 cents per foot. These figures include depreciation of and interest on plant and equipment, and 7½ per cent overhead administration. Assuming that the department could have purchased the material used since April 17, 1915, at a cost of 19 cents per cubic foot (the price paid under contract maturing about January 1, 1915), the operation of a municipally owned asphalt plant has netted the city a saving of $43,000."

Boulevard System to Encircle Tulsa.

Tulsa, Okla.—Work has been started on a boulevard system which is finally to encircle the city. A bond issue for this improvement was approved by the voters over three years ago, but was held up for a long time pending the approval of the attorney general. The boulevard system will be constructed by the city park board and will be under its supervision. It will be paved the entire length of almost eighteen miles.

New System of Road Accounting in Effect.

Olympia, Wash.—A system of cost accounting that will enable the different county engineers and commissions of the state to keep track of the cost of maintenance of all state and county roads and will furnish the state highway commissioner with data concerning maintenance cost each month for the primary permanent state highways is being established throughout the state in compliance with the highway act of the last legislature. Under the new county system the county engineers and commissioners are made agents of the highway board in maintaining the primary state highways within the county bounds. Rules and regulations for carrying on the state road maintenance work have been issued by the state board. In answer to the appeal of the highway board for more funds for the upkeep of the permanent state roads the last legislature turned all the maintenance work over to the counties and allotted the 7½ per cent of the highway fund, or $75,000, together with all the surplus of the motor vehicle fund, amounting to approximately $500,000 a year, to the counties to keep the state roads in condition. The county commissioners are bound to see that the state roads are in good shape. In case the state board finds any state road run down it has authority to give the county in which the road is located 15 days to commence repairs and in case of failure on the part of the county, the state board may step in, make the necessary repairs and charge the cost to the county's share of the road fund. The fall inspection made last year resulted in two counties being notified to make repairs. The highways law also specifies that if the counties do not find the allotment from the state sufficient to keep the permanent state highway in good condition, the permanent road construction fund may be drawn upon, and if that is not sufficient the funds are to be taken from the county road and bridge fund. When the law went into effect in June the state highway board made a set of rules and regulations to govern the maintenance work of the counties, but did not supply the cost accounting system. The board decided to let the county engineers make their monthly reports and from the reports compile a cost system to suit the case. As a result, the new cost accounting system will show the amount of money expended for every section of permanent state highway in every county. The cost reports will show the cost of maintenance of graveled road, concrete, bitulithic and other grades of construction and surfacing. The rules also require the county engineer before the end of December of each year to make out a road fund budget to show what he estimates the cost will be to keep up the state highway sections. The county commissioners at their first meeting in January pass on the budget, make any changes they desire and then adopt it, sending a copy to the state highway commissioner. The state commissioner may increase any of the items he wishes. A monthly report of the road maintenance cost also will be filed by the county engineer with the commissioners and a copy sent to the state office, where a complete record of all state highway expenditures, the cost per mile in each county for each type of highway will be made. With the new cost forms, state highway commissioner Allen sent out a complete list of instruction for carrying out the work. The cost of road maintenance will be segregated as patrol, drainage, dragging and dressing, clearing, removing obstructions, resurfacing and repair, sprinkling and sanding, structures, safeguards and signs, industrial insurance, equipment and supplies, supervision and contingencies.

SEWERAGE AND SANITATION

Asks State Cooperation in Disease Campaign.

Washington, D. C.—Surgeon-General Rupert Blue has sent the following letter to the health officers of all states after a preliminary telegram: "It is evident that the prevention of venereal infections in the military population is largely dependent on the degree with which these infections are prevented in the civil community. This imposes upon the civil health authorities the duty of forcefully attacking the venereal problem upon the basis of the control of communicable disease. There is forwarded you herewith an outline upon which it is proposed to make this attack. Manifestly, no plan which can be set forth at the present time can be complete in all its details nor can a plan be devised which, in all its phases, fits the requirements of each state exactly. Therefore, in the plan which I am sending you only the basic necessities have been stressed. Your co-operation in putting this plan in force is requested. The Public Health Service, in co-operation with the Red Cross and the Medical Department of the Army, is establishing venereal clinics in cities in immediate contiguity to the army cantonments. There is even greater need for the beginning of an active anti-venereal campaign in those cities which are outside of the military zones, but into which soldiers go in search of recreation. Most important of all, perhaps, is the thorough education of the general public to the end that this disease group will be considered in the same light as are the other communicable infections. This will permit the free and frank discussion of this important question without offense to modesty. I shall be pleased to have your views and suggestions as to the prosecution of further work along these lines. Whatever is to be done must be initiated promptly if we are to prevent the next increment of the draft from having the high venereal rate of the last."

The memorandum accompanying the letters gives, among other suggested methods of quarantine, control, and cure of the disease:

Establishment of venereal clinics by health authorities.

(1) Federal, in zones in close contiguity to cantonments.

(2) State, in situations where local authorities refuse or fail to establish clinic.

(3) City, particularly those cities in which commercialized or clandestine prostitution flourishes for the patronage of soldiers but are beyond the authority of the Secretary of War.

(4) Country, in thickly settled rural communities.

By the creation of new or the utilization of existing hospital facilities:

(1) For the treatment of those who volunteer for treatment.

(2) For the obligatory treatment of persons under control of the courts.

By legal enactment:

(1) Declaring the venereal infections to be quarantinable.

(2) by substituting confinement to hospital for confinement to jail in the case of those convicted by courts and having venereal infections.

(3) By substituting remanding to a probation officer for the imposition of fines.

(4) To carry out (2) and (3) it is necessary that all persons arrested be examined by the city physician or other authorized person.

(5) By arrest of acknowledged and clandestine prostitutes by policewomen.

Relieve problem of all moral and social issues and place campaign solely on basis of control of communicable disease.

Propaganda of wisely conducted publicity:

(1) Through public meetings adddressed by forceful speakers.

(2) Through public prints.

(3) By placarding public toilets, placards to emphasize danger of venereal diseases, and to recommend prompt treatment either by competent physician or at the free venereal clinic.

(4) By follow-up work by social workers.

(5) By the education of infected persons—(a) by physicians in private practice; (b) by venereal clinic and hospital.

Ask Time Extension for Sewage Plant Completion.

Cleveland, O.—The city council has passed resolutions asking the state department of health for an extension of time in which to complete plants built to prevent the pollution of Lake Erie and Cuyahoga river. The state health department had ordered the city to install sewage works for preventing the pollution of the lake before Feb. 13, 1918. The city has already spent and has contracted for the expenditure of more than $700,000 for the construction of sewers and treatment works in accordance with the order. Because of delay in determining the legal status of a recent act of the legislature, which permitted the raising of the necessary funds authorized at a recent election and of much time consumed by necessary studies and investigations, the city asks extension of time until Feb. 13, 1920. In the case of the Cuyahoga river, the city had been originally ordered to stop pollution by July 1, 1915, and had then had the time extended to July 1, 1917, but now it requests a further extension until July 1, 1920.

Asks State Aid to Avert Smallpox Epidemic.

Erie, Pa.—Dr. John W. Wright, city health officer, has appealed to state and federal health authorities to assist him in combating a threatened epidemic of smallpox in Erie. The action followed discovery of a new case of smallpox—a negro workman, employed at the Erie Forge works, contracting the disease. Making every effort to save the city from an epidemic, Wright claimed his efforts are thwarted by the indifference of large employers of labor, who refuse to co-operate with him in the supervision of their workmen's health. These firms bring in stray labor from outside points, especially negroes, and, he claimed, they are permitted to live in insanitary surroundings with the result that at least one new case of smallpox is discovered daily. Dr. Wright is preparing plans to remedy the situation, and expects on the arrival of state and federal health authorities that drastic action will immediately be taken. Wholesale vaccinations of employees, quarantine measures and rigid supervision of their housing conditions will be put into effect. A smallpox epidemic in Erie at the present time would be extremely serious, Wright said. There is no place where a white patient could be cared for except to be quarantined in his home. The cases now being cared for are among negroes, and these are housed in tents.

WATER SUPPLY

To Complete Water-Waste Survey.

Buffalo, N. Y.—On the recommendation of commissioner Kreinheder council has authorized a complete survey of the city's water waste at a cost of about $44,000. The Pitometer Company of New York is to do the work along the plans followed by it in a partial survey made some time ago. George C. Andrews, water commissioner, estimates that the survey will result in an annual saving of $80,000 in coal bills and of about $40,000 in wages. The city has been divided into ten districts for the purposes of this survey, one of which has been covered. Two others will be completed in the spring.

All Water Services Must Be Metered by Consumers.

Cincinnati, O.—Eighteen thousand water consumers in the city who have been paying for their water under the "survey" rate plan will be affected by an order issued by William F. von Hoene, comptroller of the water works, to the effect that all people using water under this plan must install water meters. The city is districted into six sections, and the consumers in the first are ordered to have meters by July 1. Each succeeding district follows within a month of the preceding one, so that the sixth district must install meters by December 1.

Detroit Builds Experimental Filtration Plant.

Detroit, Mich.—An experimental filtration plant has been erected by the city, and the board of water commisioners has entered into contract with an engineer to conduct a series of tests lasting about nine months. The idea of the board taking these steps at this time is only to prepare for the future, commissioner Alexander Dow explained. It has no intention of establishing a filtration plant at present. R. Winthrop Pratt, Cleveland, has been engaged to conduct the work of the plant, which will consist of filtering Lake St. Clair water under all conditions during the winter, spring and summer seasons. The cost of the work will not exceed $15,000. When tests are completed, Mr. Dow said, the board would know how much it will cost to filter the water, how much water can be filtered under any and all conditions, and where would be the best location for a filter plant.

Increased Water Rates to Meet Costs.

New Orleans, La.—The sewerage and water board has found it necessary to get more revenue, owing to rising operating costs. Of the absolutely essential articles which the board uses in pumping and filtration, coal, coagulants, lead pipe, gasoline, etc., the cost during the present year is to be about $65,000 above what it was last. To this must be added, as part of the year's expenses, whatever the 10 per cent increase amounts to in the wages of employees who receive less than $200 a month, estimated at $60,000. To meet the cost of the increase in the two items—of supplies and wages—the board has rearranged its schedule of charges to yield approximately $90,000 a year. Under the present schedule a water bill is made up of a service charge, running from fifty cents to $1.25, according to the size of the premises, and a charge of ten cents per thousand gallons after one-third of the total consumption has been eliminated as free water for sewerage purposes. The board has decided to change the amount of free water from on-third to one-fourth of the total consumption, limiting such free water to 600 gallons per person on the premises. In the case of the small consumer, whose bill is from $1.50 to $1.80, it is estimated that this will amount to only a few cents per quarter. In the case, however, of the large consumers, who use water for garages, lawns, etc., the injustice of allowing them a third of their consumption for flushing when a large proportion of it is used for other purposes will be removed, and they will be made to pay on a basis of free water more nearly comparable with that for which the smaller consumer is charged. No change is to be made in the service charge nor in the rate per thousand gallons.

STREET LIGHTING AND POWER

City to Build Hydro-Electric Plant.

Seattle, Wash.—March 1 has been set as the date for the receipt of bids for the construction of the $5,000,000 hydro-electric power plant for the city on the Skagit river. The specifications have been recently changed. Instead of calling for a lump sum bid on the power plant and transmission line complete as originally contemplated separate bids will be taken on each of these items. In order to put all bidders on an equal basis the specifications will also assume a standard price for steel. Another change will increase the interest on the warrants from five per cent to six per cent and the transmission line towers will be changed from steel to wood. Time, the specifications state, will be the important factor in the contract. Contractors are requested to state their preference on cash or warrants in payment.

Consumer Must Pay for All Current in Contract.

Oakland, Cal.—Consumers of electric current are liable for full payment on minimum rate contracts whether or not they consume the amount contracted for, according to a decision made by justice of the peace Harry W. Pulcifer of Oakland in giving judgment to the Great Western Power company in its suit against the former lumber firm of Clark & Gallagher. According to the testimony in the case the consumers agreed to take $30 worth of electric power each month for twelve months. But this minimum amount was not consumed during the period of the contract and in settling their accounts the firm paid for the power actually used by them. The power company claimed a balance of $253.45 at the rate of $30 a month and filed suit. "This is plainly a case wherein the power company is entitled to protection in the distribution of its commodity," said judge Pulcifer. "The company is bound to furnish a certain amount of power and must make adequate provision therefor each year, based upon its probable consumption and existing contracts. It would be unjust that this expense should be undertaken if the consumer should be relieved from his responsibility."

FIRE AND POLICE

$1,500,000 Blaze Sweeps Port Newark Terminal.

Newark, N. J.—What is believed to be part of a nation-wide plot to destroy shipyards, docks and war plants was a fire which swept over the new city dock at Port Newark Terminal and for hours menaced the city of wooden and concrete shacks, warehouses and work buildings that constitute the United States Quartermaster Department supply depot and the Submarine Boat Corporation shipyard. Besides the dock itself, which cost $750,000 to build, and much railroad trackage, eight barges and one scow, loaded with materials, were destroyed. Unofficial estimates of the total damage began at a minimum of $1,500,000. While up to noon not a building, either at the supply depot or shipyard, had been even singed, the fire, driven by a brisk west wind straight down the ship channel and dock, was within 200 feet of the nearest shipway. The ways, parallel to the dock, extend into the bay at right angles, and number 28, stretching north from the dock. The work of the fire-fighters in dynamiting part of the dock saved them. Four of six boats from which firemen were directing streams were bunched between the fire and the ways, directing all efforts to stopping the progress of the flames. Captain Edward J. Worth, of the New York marine fire department, commanded the battery of fire boats. Chief Moore, of Newark, said that the danger of the fire lay in the fact that it was spreading, and had spread for hours, beneath the dock. When efforts hours before dawn to check the fire's spread by fighting it from land failed, chief Moore of Newark sent for the boats. To aid the ships 200 workmen, laboring under direction of the firemen, ripped up the planking of the dock near the ways so that firemen could get water to the timbers beneath. A steam crane, run up close to the flames, aided in this work. Authorities at the terminal were on the watch for the very disaster that came. Several days before a detachment of coast guard regulars was stationed at the plant. Men of this company told of a fight in the dark with an armed man who fired upon them from the roof of a shed not fifty yards away from the spot where the fire started. The warnings that had come to them, officers and soldiers said, was that the plant was to "go" between the 19th and 21st. Whence these warnings came they could not say, although it is believed the secret service gave them. Governor Edge only the previous day issued a general fire warning to cities of the state where munitions and war plants are located. Two oil barges moored at the head of the ship channel gave the fire impetus within a few minutes after its discovery. The burning oil, spreading over the ice, set fire to the dock for a distance of 200 yards. The flames, whipped into great red pennons by the wind, were plainly visible from the city, and close at hand were of appalling proportions. Engines No. 14 and 24, which were among the first to arrive, were overwhelmed within half an hour by the flames and smoke. Their crews abandoned them until a slight shift in the wind made the positions once more tenable.

Washington, D. C.—A mysterious letter warning President Wilson of a nation-wide plot to destroy docks and war plants is being used in connection with investigation of the Newark fire. The letter in question declared the plot was to go into effect January 22. Following receipt of the warning, home guards at different points were mobilized to stand guard by vital plants. Whether the plotters were forewarned or not is not known, but at any rate the alleged conspiracy was not in action on the date originally set. Then came the series of fires that revived the charges as to a plot. The fires, started almost simultaneously at Newark, Buffalo and Baltimore, destroying hundreds of thousands of dollars in property, led officials here to believe that there is a widespread movement afield to concentrate enemy action on America's war plants and docks.

Fire Destroys Pumping Plant.

Greybull, Wyo.—The city's old pumping station has been destroyed by fire. When the alarm was given the tank was found empty. The building was a complete loss. The machinist succeeded in getting one of the pumps started. No trace has been found of how the fire originated. The new building, at the time being erected, is about completed and the other pump will be working soon.

Two-Platoon System in Effect.

St. Paul, Minn.—With nearly 500 of the necessary 530 men available, St. Paul's fire department has been placed on the two-platoon system. According to a statement by commissioner McColl, "We have sufficient certified men to make a good start and a week should find the new system working throughout the city. Where there is a deficit of certified men we will place temporary men. These workers will not be required to purchase uniforms until their appointments are made permanent." Under the new system, men work alternate two weeks on the day and night shifts. The day men work from 8 a. m. to 6 p. m. This will necessitate their taking their lunches with them in the morning. Night men will work from 6 p. m. to 8 a. m., sleeping at the fire stations.

Firemen Receive Wage Increases.

Joplin, Mo.—The city's firemen are greatly pleased over the favorable settlement with the mayor and council of the wage question. Formerly firemen entered the service at $70 and after a year received $80. They were given one day off in five. There were 35 men in the service. Under the new arrangement the wage will be $75, $80, $85 and $90. The firemen will receive one day off in eight, and the number in the service is to be reduced to 32 men. This will not mean that any firemen now employed will lose his position. Already there are three vacancies, and in order to keep the number at 32 mayor Poole will neglect to make new appointments. At the last conference of the mayor and members of the department it was explained that it would be utterly impossible for the city to meet the demands of the firemen for an increase from $80 to $90 unless there could be a reduction in the number of men employed and also a reduction in the time off duty.

Withdraws Fire Protection Outside City Limits.

Canton, O.—Fire chief Mesnar has announced that as a result of the failure of the citizens of North Industry to pay to the city of Canton $50 charged against the village for services at a fire several months ago he would advise the residents of the village to provide a fund for this purpose if they expect the Canton fire department to answer calls in the future to aid in fires there. Mesnar said that when the citizens failed to meet the charge which is made by the city for all assistance rendered to towns outside Canton, the owner of the block which burned came to him and paid $40 of the $50 due.

Gasoline Leak and Lighted Lamp Cause Big Blaze.

Norfolk, Va.—A two-story brick garage was destroyed here, together with more than thirty automobiles and trucks, in a fire which was caused by a negro holding a lighted lamp near the drip from an automobile fuel tank. The damage totaled $100,000. Within a hundred yards of the scene of the blaze is a big Du Pont warehouse. The fire spread quickly through the building and it was in full blaze when the firemen arrived. Two early explosions of a minor nature scattered the blaze and the walls crumbled to the ground very quickly. Employees of the garage were successful in removing but one machine. There was little the firemen could do but prevent spread of the flames to the adjoining building. A detachment of sailors was sent over from the navy yard and they were of material assistance to the firemen in preventing spread of the flames.

GOVERNMENT AND FINANCE

Manager Goes from One Massachusetts City to Another.

Waltham, Mass.—Clarence A. Bingham, city manager of Norwood, Mass., has been unanimously appointed city manager of this city by the council. He will assume his duties on April 1, under the plan D charter. His term is unlimited and he is to receive a salary of $5,000 a year. On April 1, 1915, Mr. Bingham was appointed town manager at Norwood. He was among the speakers from Norwood who told of the working of the town manager form at meetings here when the change in government was being agitated. Mr. Bingham was born in Elizabeth, N. J., and he is thirty-two years old. He was graduated from Rutgers college in 1906. For a period of three years he was assistant city engineer at Elizabeth and he subsequently engaged in engineering work with the Pennsylvania R. R., the Lehigh Valley R. R. and in other similar positions.

Wife Takes Seat of Dead Alderman.

Troy, N. Y.—The first woman member of a common council body in the state took her seat at the organization meeting of the Troy board of aldermen. The representative is Mrs. Patrick J. Kennedy, of the fifth ward, and she takes the place to which her late husband was elected in November last. The mayor filled the vacancy

May Not Withdraw Improvement District Signatures.

Nashville, Ark.—The supreme court of Arkansas has handed down a decision refusing to allow the withdrawal of a petitioner's name from a petition for an improvement district after he has decided that the district is not advisable. Two improvement districts had been proposed for the city, one calling for a sewer district and the other for the construction of waterworks. The plaintiff endeavored to have the district invalidated after the city council, acting on the original petitions, had created them. In support of this contention, it was claimed that several of the signers of the original petitions sought, before the matter was finally settled by the council, to have their names removed on the ground that the time is now inopportune to form such districts and that the burden of taxation would be too heavy. The supreme court held that the names could not be withdrawn on the grounds presented, inasmuch as the questions raised should have been fully considered before the petitioners affixed their signatures to the original petitions. The further ground was held that any action to invalidate the district should have been taken within thirty days after the passage of the ordinance creating the district in accordance with the provisions of the statutes. Both districts were declared valid.

TRAFFIC AND TRANSPORTATION

Canadian City Votes for Municipal Railway Ownership.

Toronto, Ont.—The taxpaying voters of the city at a recent election voted in favor of the acquisition by the city of the Toronto railway system in 1921. At that time the thirty-year franchise in force at present will expire. The vote gave an overwhelming majority in favor of the proposition, about 39,000 to 3,700.

Owl Fare Case Lost by Company.

Pittsburgh, Pa.—The supreme court has handed down a decision at Philadelphia which upholds the superior court, which recently decided that the Pittsburgh railways had not given sufficient time before inaugurating a ten-cent night fare. The superior court upheld the state public service commission in its decision that the company could not increase its fares at night on the ground that it had not given the public proper notice of the proposed change. No opinion was expressed either by the commission or the court in regard to the authorization of an increase in rates.

Permanent Injunction Against Jitneys.

Portland, Ore.—United States district judge Neterer, in Seattle, Wash., has made permanent the temporary injunction issued on the application of the Puget Sound Traction, Light & Power Company restraining about 190 jitney operators from operating jitney buses in competition with the cars of the company. The validity of the temporary injunction was attacked chiefly on the ground that the defendants claimed not to be acting as common carriers, and that, therefore, they did not come within the provisions of the law passed by the last legislature requiring jitney owners to furnish indemnity bonds. In disposing of this contention, as well as the claim of the defendants that they are operating "free buses," judge Neterer said that the purpose of the law requiring jitney operators to furnish bonds was to protect the public against irresponsible operators, and that the act, therefore, must relate to all engaged in like business. Judge Neterer said: "The defendants are not operating 'free buses.' Operating a jitney is one of the sources of income and is employment for private gain. A card on the windshield on the outward side of which appears 'free bus' and on the inward side of which appears 'contributions received for defense fund against the traction company' is clearly a subterfuge, and will not excuse the defendants from compliance with the provisions of the act. It is an evasion which the law will not countenance. The law may be very undesirable. The motive which inspired it may have been unworthy. The wisdom of the law or the motive which inspired it are not matters for judicial termination on this trial. This court is merely concerned with the law as it relates to the facts presented. The defendants are not prohibited from operating jitneys. They are merely required to comply with a regulatory statute which has been held by the supreme court of the state to be constitutional." In concluding his opinion, judge Neterer said that while the evidence shows that the plaintiff company has been damaged by reason of the acts of the defendants, there was no testimony upon which the court could base the amount of damages, except upon conjecture and surmise, and he, therefore, directed the entry of an order awarding nominal damages to the plaintiff company.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

Feb. 4.—OREGON SOCIETY OF ENGINEERS. Annual meeting, Portland, Ore. Secretary, Orrin S. Stanley.

Feb. 4-7.—AMERICAN ROAD BUILDERS' ASSOCIATION. Fifteenth annual convention, Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau street, New York City.

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 20.—CAROLINA ASSOCIATION OF HIGHWAY ENGINEERS. First meeting, Chapel Hill, N. C. Secretary, N. S. Mullican, county highway engineer, Lexington, N. C.

Feb. 21, 22.—NORTH DAKOTA SOCIETY OF ENGINEERS. Tenth annual convention, Fargo, N. D. President, J. A. Ingram, Grand Forks.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Road Builders' Association.

The program of the fifteenth annual convention of the American Road Builders' Association, to be held at the Hotel Statler, St. Louis, Mo., February 4 to 7, will be as follows:

On Monday morning, at the first session, formal addresses of welcome will be delivered by Governor Fred D. Gardner, for the state; Major Henry W. Kiel, for the city; President Jackson Johnson, for the St. Louis Chamber of Commerce, and Secretary A. C. McKibbin, for the state highway board. President H. E. Breed will reply for the association.

At the afternoon session the following papers will be read: "Traffic Laws in Relation to Highway Maintenance and Construction," by W. A. McLean, deputy minister of highways, Province of Ontario. The discussion will be led by W. Leroy Ulrich, superintendent of repairs, Connecticut state highway department. "Illinois Scheme of Financing by Bond Issue," by S. E. Bradt, superintendent of highways, division of highways, Illinois Department of Public Works and Buildings.

At the evening session, at 7:30 p. m., "Roads in the Hudson River District with Unusual Construction Features" will be the title of an illustrated talk on Palisades Pard Roads, the Hendrick Hudson Drive and the Storm King Road, by W. A. Welch, chief engineer, Palisades Interstate Park Commission. There will then be shown pictures of war roads, three reels depicting the movements of the British army in France.

On Tuesday the session will open at 9:30 a. m. with "The Highway and Its Relation to Transportation," by S. M. Williams, sales manager, Garford Motor Truck Co. There will then be presented: "The Delivery of the Motor Truck from the Factory to the Seaboard Under Its Own Powers," by Raymond Beck, of the Highways Transport Committee, and "The Efficiency of the Motor Truck in Terms of Cost Per Ton-Mile," by R. E. Chamberlain, manager of motor truck sales, Packard Motor Car Co.

The fifth session, in the afternoon, will include: "How to Lay Out and Justify a Program for War Roads," by George C. Diehl, county engineer, Erie county, New York, and chairman of the Good Roads Board of the American Automobile Association, and "The Creation of a More Equitable Contract Between Highway Commissions and Contractors," by J. C. Travilla, consulting highway engineer, St. Louis, Mo.

In the evening, at 7:30 p. m., there will be an entertainment and smoker in the Hotel Statler, to which admission will be by badge.

At the sixth session, Wednesday morning, will be read: "New Features in Brick, Wood Block and Stone Block pavements," by Clifford Older, chief highway engineer, division of highways, Illinois Department of Public Works and Buildings (discussion led by Clinton Fisk, chief engineer of construction, city of St. Louis); "Short Cuts in Contracting and the Use of Labor Saving Machinery," by A. J. Rockwood, contractor, Rochester, N. Y. (discussion led by F. E. Ellis, contractor, manager of the Essex Trap Rock & Construction Co., Melrose, Mass.)

The afternoon will be devoted to trips about the city of St. Louis and visits to points of interest, while in the evening the annual subscription dinner will be held in the Hotel Statler.

The next session, Thursday morning, will take up "New Features in the Design and Construction of Bituminous Roads and Treatments and Cement Concrete Roads and Pavements," by Charles M. Upham, chief engineer, Delaware state highway commission. The discussion will be led by A. B. Dunning, chief engineer, Constructing Quartermaster, Fort Oglethorpe, Ga.

The eighth session, in the afternoon, will discuss "New Features in the Maintenance and Reconstruction and Repair of Earth, Sand-Clay, Gravel, Water-Bound Macadam and Bituminous Roads, Penetration Method," by Alexander W. Graham, state highway engineer of Missouri.

At the final session, 7:30 p. m. Thursday, will be presented two papers on "Road Construction in the Northeast Cantonments," by Philip P. Sharples, manager, General Tarvia department, the Barrett Company, and "Road Construction in Other Cantonments," by A. N. Johnson, consulting engineer, Portland Cement Association.

United Engineering Society.

At the annual meeting of the trustees of the United Engineering Society, January 25, the following officers were elected for the ensuing year: President, Charles F. Rand, American Institute of Mining Engineers; first vice-president, Calvert Townley, American Institute of Electrical Engineers; second vice-president, Robert M. Dixon, American Society of Mechanical Engineers; treasurer, Dr. Joseph Struthers, American Institute of Mining Engineers; secretary, Alfred D. Flinn, American Society of Civil Engineers; chairman, finance committee, J. Vipond Davies, American Society of Civil Engineers.

New England Water Works Association

Following the letter ballot, it has been announced that the candidates for office nominated by the nominating committee have been elected. The officers of the New England Water Works Association are therefore: President, Carleton E. Davis, chief, Bureau of Water, Philadelphia; secretary, Willard Kent, Narragansett Pier, R. I., and editor, Henry A. Symonds, Boston.

Albert Pike Highway Association.

About 400 delegates were present at the convention of the Albert Pike Highway Association, held in Fort Smith, Ark., January 10 and 11. The association's object is the construction of a hard surface road from Hot Springs, Ark., to Colorado Springs, Colo.

The road building program of the states of Missouri, Oklahoma, Colorado and Arkansas were outlined at the afternoon and night sessions of the first day by E. L. Sanford, of Springfield, Mo., a member of the state highway commission of that state; Max L. Cunningham, state highway engineer of Oklahoma; Hugh H. Carter, state highway engineer of Arkansas, and Thomas Tynan, superintendent of the Colorado penitentiary. The latter address was illustrated with moving pictures and views of the convict road camps and the sections through which the convicts had built roads, both before the work began and after it was completed.

On Friday morning Governor Charles H. Brough of Arkansas delivered an address on road conditions in the state. J. D. Fauntleroy, Ft. Worth, Texas, engineer of the sixth federal aid district, read an instructive paper on "Maintenance of Roads." Resolutions were passed affirming the loyalty of the members and advocating the use of convict labor on highway work.

Closing addresses were made by Judge Cleveland Holland of Ft. Smith, George Callahan of Hot Springs and Secretary Guthrey of the Tulsa Chamber of Commerce.

The association closed its convention after re-electing Cyrus S. Avery of Tulsa, Okla., president and E. Bee Guthrey of Tulsa secretary. Enid, Okla., was voted the 1919 convention city. Every state in the association changed its vice-president, the new vice-presidents being A. J. Lawton, Colorado; H. P. McCausland, Kansas; H. E. Noble, Oklahoma; George A. Callahan, Arkansas.

North Dakota Society of Engineers.

The tenth annual convention of the North Dakota Society of Engineers will be held at Fargo through Thursday and Friday, February 21 and 22. The program includes regular reports and special discussions on municipal improvements, specifications, roads, drainage, concrete, lignite mining and fuel distribution, the engineer's part in the war, the engineer's position as a citizen, and other topics of interest and importance to the members.

The president of the society is J. A. Ingram, Grand Forks, and the secretary is E. F. Chandler, state university.

Virginia Good Roads Association.

About three hundred delegates were present at the opening meeting of the Virginia Good Roads Association's seventh annual convention, held in Richmond, January 15 to 17. One of the most important subjects considered was that of getting the legislature to provide funds for constructing the 3,500-mile system of roads reported by the legislative road committee.

The convention was opened by an address on the "Effect of the War on Road Improvements" by H. F. Bishop, district engineer, U. S. Office of Public Roads, which was discussed by F. D. Henley.

The two papers presented at the afternoon session were: "The Farmers and Road Improvement," by A. B. Thornhill, president, Virginia Division, Farmers' Educational and Cooperative Union, and "Highway Legislation in Virginia," by G. P. Coleman, state highway commissioner.

The Wednesday morning session featured papers by Harris Hart, superintendent-elect of public instruction, on "Effect of Road Improvement on the Public Schools," and C. O'Connor Goolrick, chairman, on "Work of the Legislative Road Committee."

In the afternoon, S. L. Von Gemmingen, engineer of maintenance, spoke on "Highway Maintenance in Virginia," and H. G. Shirley, chief engineer, Maryland State Roads Commis-

(*Continued on page 104.*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Buffalo, N. Y., is to have completed a SURVEY of WATER WASTE, which has been started by the Pitometer Company.

A WATERWORKS SYSTEM is to be built by Glassport, Pa. Plans are in course of preparation by the consulting engineer, Leo Hudson.

SANITARY SEWERS are to be built by Lake City, Ia., plans and specifications for the work having been prepared by the engineer, C. H. Currie.

A WATER SYSTEM is contemplated by Red Fork, Okla. Plans and specifications for the work have been completed by the Hughes Engineering Company.

A SEWAGE DISPOSAL PLANT and SEWERS are to be built by Marcus, Ia. Plans and specifications for the improvements were the work of R. W. Moore.

A SEWAGE DISPOSAL PLANT is to be built by Parsons, Kans. The engineers, Black & Veatch, are drawing preliminary plans for the improvement.

The WATER SYSTEM of South Milwaukee, Wis., is to be extended. The city is having plans for the improvement prepared by the Caldwell Engineering Company.

Texarkana, Ark.-Tex., is to build a joint SEWAGE DISPOSAL PLANT. The city has retained as consulting engineer L. T. Peden.

WHARVES and DOCKS are to be built by Pascagoula, Miss. The city is having plans for the improvement prepared by T. W. Nicol.

Lodi, N. J., is to improve its WATERWORKS. The city's consulting engineer is Thomas F. Bowe.

Tipton, Kans., is to construct WATERWORKS, bids having been called for. Plans for the work were by the consulting engineer, G. P. Taylor.

The WATERWORKS SYSTEM of Mitchell, S. D., is to be rehabilitated and a new supply developed at a cost of about $125,000. Plans and specifications are being prepared by the consulting engineering firm of Burns & McDonnell.

An experimental FILTRATION PLANT has been built by Detroit, Mich., in order to determine operating costs and conditions in case a plant is built by the city in the future. R. Winthrop Pratt, consulting engineer, has been retained to conduct a series of experiments for a period of nine months.

PERSONALS

Mayor-elect Sherman Cutshall, Ft Wayne, Ind., has announced the following appointments: City attorney, Creighton H. Williams; board of works, John O. Brown, chairman, Andrew T. Anderson and Dr. C. L. Baird; the board of safety. B. Frank Sarver, chairman, J. Bert Mills and W. G. Berdelman; the board of health, Dr. Eric Crull, chairman, Dr. A. L. Schneider and Dr. A. J. Kessler.

Hall, William B., formerly city engineer of Oconto, Wis., is now a major in the 150th Machine Gun Battalion, and is now in France.

Mayor-elect Charles R. Hunter, Terre Haute, Ind., has appointed the following new officials: John Beattie, police chief; Carl E. Evinger, chief of the fire department; Carl Gott, street commissioner.

Jewett, Charles W., new mayor of Indianapolis, Ind., has made the following appointments: City controller, Robert H. Bryson, and city purchasing agent, Dwight S. Ritter. He has recommended George V. Coffin for chief of police and John C. Loucks for fire chief. He has appointed Alexander L. Taggart, Felix M. McWhirter and Jacob H. Hilkene to the board of public safety. Mr. Hilkene was formerly for four years city building inspector and before that he was foreman at the factory of Hetherington & Berner, makers of asphalt plants.

Potter, Alexander, has been retained by the United States Government to act as consulting engineer in the design and construction of the sewerage, drainage and water supply systems for the new Government explosives plant to be located near Charleston, W. Va., upon which will be expended a total of sixty million dollars.

City manager Bates, Portsmouth, Va., has appointed the following: George C. Stanley, jr., chief of fire department; James M. Broughton, chief of police; George F. Mathews, city electrician and assistant building inspector; Paul Whitehurst, chief engineer of sewage pumping station; J. H. Fleming, superintendent of street cleaning and garbage removal.

The following are new officials:

Sheridan, Wyo.—Mayor, M. B. Camplin; commissioners, Harry Loucks and W. Birkhaeuser.

Newport, Ky.—Mayor and commissioner of affairs, T. J. Livingston; vice-mayor and commissioner of finance, C. D. McCrea; commissioner of public works, Joseph Hermann; commissioner of public property, Christian Ebert, and commissioner of public safety, Daniel Riedel.

Yonkers, N Y.—Commissioner of public works, Thomas H. Lee; city engineer, Lawrence Griffith; commissioner of public safety, Walter B. J. Mitchell.

Walla Walla, Wash.—Mayor and commissioner of police and public safety, I. F. Powell; commissioner of finance and accounting, A. K. Dice;

(*Continued on page 104.*)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

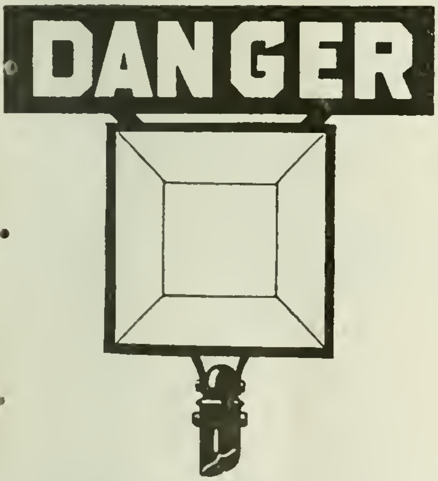
HIGHWAY DANGER SIGNAL.

Automatic Operation and Novel Design.

The automatic highway danger signal shown in the accompanying illustration makes use of a principle hiteherto unused in the design of warning signs. The signal operates on the principle of angular reflection, and requires neither electric nor oil lamps.

It is constructed in such a manner that at night it will return red rays of light to an approaching automobile driver, regardless of his position on the roadway. It may be focussed in such a manner that at a point of from one hundred to one thousand feet the signal will appear in the form of a big ball of fire, instantly and unfailingly warning of the danger point ahead. It is claimed that the signal may be operated for at least ten years without the need of maintenance costs.

The signal case is made of heavy gauge, hot galvanized steel, which is 12 inches square and 3 inches deep. This case contains the colored glass lens, 5/16 of an inch thick. Upon the signal case is mounted the "danger" sign, which is 22 inches long by 6 inches wide, black electro-galvanized. The embossed letters are covered with a luminous silver lustre coating. The signal case is mounted on a high carbon steel, electro-galvanized post, 2⅜ inches in diameter and 6 feet long. It has a universal knuckle-joint for adjusting the radius of the lens. The post is driven into the ground immediately beside the roadway to a depth of 32 inches from the road level.



AUTOMATIC HIGHWAY SIGNAL.
(Note Square Red Reflecting Lens.)

This signal has been found effective for warning any moving vehicle carrying lights. It is installed at embankments, grade crossings, dangerous curves, etc. It is not affected by adverse weather conditions or sudden cutting off of electric current.

This signal has been endorsed and purchased by Mr. Batchelder, executive secretary of the American Automobile Association, Washington, D. C., and by many county commissioners and city officials. The Northern Ohio Traction and Light Company, Arkon, O., recently adopted this signal as its standard warning device for grade crossings. It has been found very successful at a dangerous turn at Rocky River by Fred H. Caley, secretary of the big Cleveland Automobile Club.

The signal is made by the Automatic Signal and Sign Company, Canton, O.

INDUSTRIAL NEWS

Cast Iron Pipe.—Prices remain constant. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

The Highway Industries Association.

The significance of the organization meeting of the Highway Industries Association, which, for the first time, brings together all industries directly interested in the use and construction of highways, has been widely recognized. It was estimated that the 155 delegates present represented 1,500 separate plants, with a combined capital of $400,000,000.

The meeting was addressed by James I. Blakeslee, fourth assistant postmaster-general, who is in charge of the rural delivery system, on the proposed motor truck transportation plan.

The following officers were elected: President, S. M. Williams, Lima, O.; 1st vice-president, A. R. Hirst, Madison, Wis.; vice-president, Lion Gardner, New York, N. Y.; 3d vice-president, S. T. Henry, Washington, D. C. The secretary and treasurer will be appointed by the board of directors.

The constitution adopted recognizes three classes of membership. (a) Organization; (b) Company; (c) Associate; (d) Subscribing. An organization member shall be a national association, composed of companies, firms or individuals, whose business interests embrace the construction or use of public highways. A company member shall be a company, firm or individual whose business interests embrace the construction or use of public highways. An associate member shall be an association or civic body not eligible for membership as heretofore provided and who may desire to co-operate with this association. Associate members shall have all the privileges of membership except the right to vote. A subscribing member shall be any one eligible to any of the other classes of membership. Subscribing members shall have all of the privileges of membership except the right to vote. The membership of any member may be terminated at any time by resignation or by action of the board of directors for cause to them considered sufficient. A member shall remain liable for all unpaid dues payable before such termination of membership. The annual dues for a member of Class A and Class B membership shall be $100, payable at the time of becoming a member and on the first day of January in each year following. There shall be no dues for a Class C membership. Class A, B and C members may subscribe for additional memberships in Class D, with annual dues of $100, payable at the time of becoming a member and on the first day of January in each year following.

Each national association will elect one representative for director of the Highway Industries Association. Company, firm or individual membership will elect one director for every fifty members.

Among the associations represented were: National Association of Road Machinery Manufacturers, Portland Cement Association, Sewer Pipe Manufacturers' Association, the Macadam Association, Wisconsin Crushed Stone Association, Southern Paving Brick Manufacturers' Association, National Automobile Chamber of Commerce, Michigan Concrete Roads Association, American Association of State Highway Officials, Motor Accessories Manufacturers' Association, National Paving Brick Manufacturers' Association, American Automobile Association, Greater Iowa Association, Ohio Good Roads Federation, National Association of Sand and Gravel Producers, Western Paving and Brick Manufacturers' Association, National Association of Asphalt Block Manufacturers, National Crushed Stone Association.

Present headquarters are temporarily located at Lima, but may be moved to Washington, due to war conditions. Permanent headquarters may be located at Chicago or Cleveland.

R. J. DeLong, 516 Anthony street, Williamsport, Pa., in addition to being engaged in a general contracting business, is operating a coal yard, and expects to carry a full line of sewer pipe, cement, reinforcing steel, expansion joints, and other construction materials. He desires price lists, catalogues and other information.

The Ransome-Leach Company, with executive offices at 115 Broadway, New York, N. Y., has been formed by the combination of the **Ransome Concrete Machinery Co.** and the **Oshkosh Manufacturing Co.,** of Oshkosh, Wis. This combination will be in a position to handle the western trade from the Oshkosh factory and the eastern trade from the Dunellen, N. J., factory. In addition the Oshkosh Manufacturing Co. makes the well-known "Ever-ready" sawing and wood-working machinery, which has been added to the line. Duplication of manufacturing and selling will be eliminated. One large warehouse will be established in every principal city, at which a stock of equipment will be ready for immediate deliveries. A full line of trench pumps, back fillers and material elevators has been added. The new combined catalogue of the company will be issued shortly.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., has published edition No. 5 of its comprehensive catalogue of fire protection equipment and fire department supplies. The book covers the field completely and is fully illustrated. The arrangement makes the catalogue very convenient for ordering. The catalogue is divided into six sections: Fire station and apparatus equipment; lanterns, searchlights, etc., oil and electric; tools, tool holders, general equipment; gongs and bells, fire signals; fire hose and connections; play pipes and nozzles; hose racks, rolls and two-wheel hose carts; hand fire extinguishers and larger types of chemical apparatus; firemen's clothing and equipment; "safety-first" equipment. This encyclopedia of fire department needs should prove valuable on the desk of every mayor, city manager, councilman, fire commissioner, fire chief and purchasing agent.

Record Portland Cement Production for 1917.

The year 1917 holds the record for production of Portland cement, a total of approximately 93,554,000 barrels having been manufactured, an excess over the former high production of 1913 of nearly 1,500,000 barrels, and over the production of 1916 of more than 2,000,000 barrels, or 2.2 per cent. The shipments in 1917 of approximately 90,630,000 barrels fell below those of the record year, 1916, by nearly 4,000,000 barrels, or about 4 per cent. Stocks at mills increased more than 2,800,000 barrels, or 33.7 per cent, as compared with 1916.

Higher prices for cement prevailed throughout the United States except at a few plants in the Pacific Coast district. Higher prices were, however, accompanied by higher costs of manufacture. Demand for cement was generally very good during the first five to eight months of 1917, but showed a decided falling off during the remainder of the year. Labor and traffic conditions were, for the most part, unsatisfactory.

Three new plants reported the production of Portland cement in 1917: the Hercules, at Stockertown, Pa., the Fort Dodge, at Gilmore City, Iowa, and the Beaver, at Gold Hill, Ore., and one plant, the Giant, at Norfolk, Va., resumed operations after an idleness of several years.

The statistics were compiled under the direction of Ernest F. Burchard, of the United States Geological Survey, Department of the Interior.

NEWS OF THE SOCIETIES

(*Continued from page* 102.)

sion, gave an address on "Highway Improvement in Maryland."

On the final day of the convention, the following papers were presented: "Economy and Efficiency in State and Local Governments," by P. H. Drewry, chairman of the legislative committee on efficiency and economy; "Toll Roads in Virginia," by C. L. Scott, jr., highway engineer, Fayette County, W. Va.; "The Automobile and Highway Improvement," Maurice G. Long, attorney, Norfolk, and "Traffic Regulations," A. G. Batchelder, executive chairman, American Automobile Association.

Engineers' Club of Dayton.

The new home of the Engineers' Club of Dayton, the magnificent new building donated by Col. Edward A. Dleds and Charles F. Kettering, was dedicated with appropriate exercises on February 2. Features of the dedication were a reception to ladies in the afternoon, and a banquet in the evening, followed by the dedicatory exercises. The object of the building is "to cement friendship, to educate the youth, to foster all types of engineering work in Dayton and to hold ever aloft our devotion to the truth."

Illinois Firemen's Association.

Among the questions most discussed at the convention of the Illinois Firemen's Association, held at the Masonic Temple, Joliet, Ill., January 8 and 9, was that of pensions. This was discussed by William Lister, city attorney of Evanston; William R. McCabe, state representative, and John Dooley of Chicago.

President Sorgenfrei reviewed the growth of the association during the past year and pointed out that it had gained 80 departments since he took office as president three years ago. The firemen honored the memory of the seventeen comrades who died in service in 1917.

Frank Nelson, Granite City, gave an address on "Fire Hazards in a Manufacturing City." State Fire Marshal John G. Harber spoke on "Fire Prevention and Better Protection." E. W. Weidler took up the subject of "Fire Loss; Its Cause and Remedy." Fire department preparedness was urged in a paper by A. W. Thode, Galena, read by Dennis Ryan. An extended discussion followed Mr. Thode's paper and delegate after delegate took the floor asking that the association send an appeal to the heads of villages to prepare for fire by supplying their firemen with adequate apparatus. A delegate from Dallas appealed to the association to send experienced firemen to that city to lecture to residents so that proper fire equipment be supplied.

Oklahoma Society of Engineers.

A number of legislative matters were taken up at the last annual meeting of the Oklahoma Society of Engineers. A committee was appointed to present to the next legislature a revised highway law, emphasizing efficiency in the building of permanent highways. The society also passed a resolution favoring further extension of good roads and urging further federal aid. The society elected the following officers: President, M. L. Cunningham, state engineer; Secretary-treasurer, H. V. Hinckley, Oklahoma City, Okla.

Carolina Association of Highway Engineers.

The Carolina Association of Highway Engineers was recently organized by the highway engineers of North and South Carolina. The following offices of the society have been elected: R. T. Brown, president, Columbia, S. C.; W. M. Peyton, vice-president, Rutherfordton, N. C.; N. C. Hughes, vice-president, Gaffney, S. C.; N. S. Mullican, county highway engineer, Davidson county, secretary, Lexington, N. C.; and A. F. Brown, treasurer, Owensboro, N. C.

The first regular meeting of the association is to be held in Chapel Hill, N. C., on February 20.

PERSONALS

(*Continued from page* 102.)

commissioner of streets and public improvements, H. H. Crampton.

The following are new mayors:

Willimantic, Conn.—Charles Gates.

Rockville, Conn.—John P. Cameron.

Venice, Cal.—Edward S. Hill.

Greensburg, Ind.—Dr. Cassius C. McCoy.

Taunton, Mass.—William Flood.

Brockton, Mass.—William L. Gleason.

Cambridge, Mass. — Edward W. Quinn.

Marlboro, Mass.—Charles F. McCarthy.

Salem, Mass.—Dennis J. Sullivan.

Chicopee, Mass.—Daniel J. Coakley.

Leominster, Mass.—Henry F. Sawtelle.

Nashua, N. H.—James B. Crowley.

Rochester, N. H.—James B. Young.

Gardiner, Me.—Dr. Charles J. Bragdon.

Boston, Mass—Andrew J. Peters.

Newport, R. I.—Clark Burdick.

Meriden, Conn.—Henry T. King.

Harrisburg, Pa.—Samuel L. Keister.

Municipal Journal

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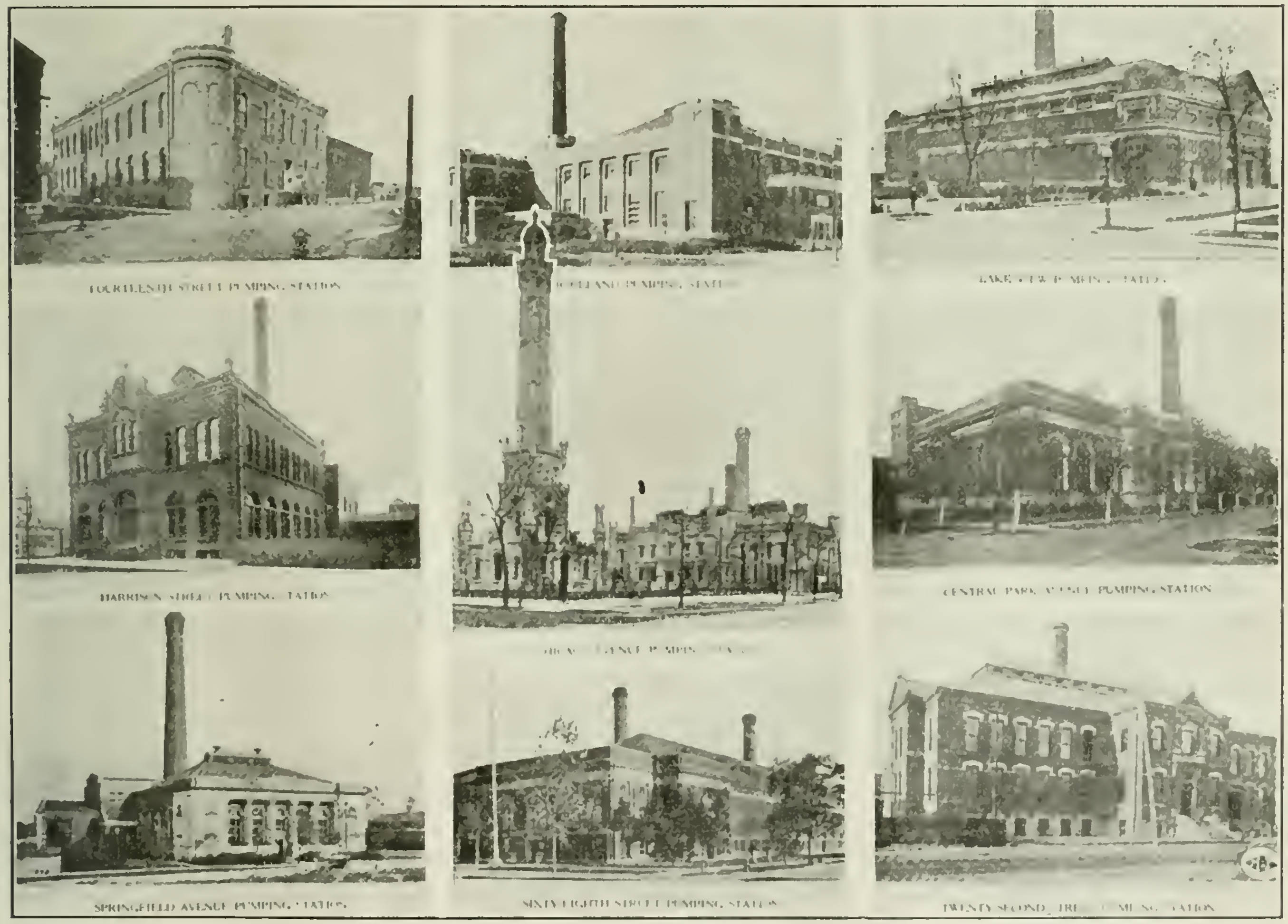
100,000 TONS OF COAL WASTED BY CHICAGO

Water-Wasters Cause Unnecessary Pumping That Requires the Use of That Amount, and Also Necessitates the Expenditure of Three and a Half Million Dollars Annually for New Equipment.



FOURTEENTH STREET PUMPING STATION

ROSELAND PUMPING STATION

LAKE VIEW PUMPING STATION

HARRISON STREET PUMPING STATION

CHICAGO AVENUE PUMPING STATION

CENTRAL PARK AVENUE PUMPING STATION

SPRINGFIELD AVENUE PUMPING STATION

SIXTY-EIGHTH STREET PUMPING STATION

TWENTY-SECOND STREET PUMPING STATION

WHERE THE CHICAGO WATER WORKS BURNS 200,000 TONS OF COAL A YEAR.

The Chicago Waterworks pumps and sterilizes two and a half times as much water as the consumers actually use, the balance—waste and leakage—amounting to more than the combined consumption of Milwaukee, Boston, Cleveland and St. Louis.

The coal required for pumping this waste during one year amounts to about 100,000 tons—more than enough to heat all the public schools during the present coal-famine winter. This useless pumping adds about half a million dollars a year to the operating expenses.

In addition, three and a half million dollars is spent annually in an attempt to keep the plant adequate for the extravagantly excessive service, and even this amount is not sufficient. If the waste could be stopped, no more such additions need be made for more than thirty years to come.

The wasteful consumption of water so reduces the pressure in the mains that over more than three-fourths of the area of the city it is less than half of that recommended by the National Board of Fire Underwriters; and in only one of the 35 wards does it equal the recommended pressure.

The above startling facts are derived from a report entitled "The Waterworks System of the City of Chicago" that has just been published by the Chicago Bureau of Public Efficiency. This report contains 207 pages, 28 of which are occupied by diagrams, photographs and other illustrations. A considerable part of the report is devoted to a description of the waterworks system of the city, but the purpose of the entire report is to make public and emphasize the enormous amount of unnecessary waste, and the undoubted increase in this which will occur, with the consequent waste of public funds involved, unless radical methods are carried out for greatly reducing it. The main points brought out in the report we will endeavor to give in a brief synopsis.

With approximately two-and-one-half million population, Chicago is pumping into its water mains 14 per cent more water than New York receives by gravity (with no pumping costs) for the use of a population of five and one-half million. It supplies more water than any other waterworks system in the world.

Lake Michigan offers an inexhaustible source of supply, but to deliver this to the citizens costs an enormous amount of money. During 1916 it cost more than $1,000,000 just to pump this water. In addition to this, as the consumption rapidly increases, it is necessary to add from year to year to the pumping equipment and to the intakes into the lake at the cost of many millions. If the consumption were cut down to a reasonable amount, however, the present equipment as to pumping plants and intakes would suffice, it is estimated, for thirty-three years to come, thus relieving the city of enormous expenditures which the growing consumption is already demanding. Enlargements and extensions are progressing at the rate of about $3,500,000 a year, in an effort to cope with the problem of water waste by furnishing additional water to waste instead of by checking the waste that is already occurring. So great a draft is this making upon the department's finances that it has been recommended that the water rates be increased 20 per cent, and some such action will be unavoidable before long unless the waste is stopped.

PRESSURE IN MAINS.

In spite of the millions being spent continually to keep the supply up to the demand, the pumping equipment fails in this occasionally and the pressures fall undesirably low in various parts of the city. An effort is made to maintain a minimum pressure of 25 pounds, which is ten or fifteen pounds lower than is considered desirable and 25 pounds less than that recommended as a minimum by the National Board of Fire Underwriters; but pressures reported in 1917 show that, of the 35 wards, 28 have a minimum pressure of less than 25 pounds, and 13 wards have a minimum pressure of less than 20 pounds; while in 16 wards the maximum pressure is estimated at less than 25 pounds. In most parts of the city, water is not being supplied above the third floors at any time, while during periods of greatest demand even the third floors are not supplied.

FILTRATION NECESSARY.

Another consideration is the necessity of filtering the water. Under present conditions the lake water at Chicago, taken at cribs several miles from shore, is good a large part of the time, but at other times it is badly polluted and unfit for drinking purposes unless sterilized or otherwise purified. Several well-defined sources of contamination are:

1. The flushing into the lake of the sewage of the Calumet District with every considerable flood. (The Calumet-Sag channel is being constructed with a view to remedying this, but it is doubtful whether it will prove entirely effective.)

2. Neighboring cities adjacent to Chicago still empty their sewage into the lake, where winds and currents sometimes carry it to the intakes.

3. Although the Chicago drainage canal has caused the Chicago river normally to flow away from the lake, at times the current is reversed and it flows directly into the lake; this being caused by sudden barometric changes.

4. The increase of population along the twenty or thirty miles of lake front which is now thickly populated has undoubtedly led to increased pollution of the lake water from various industries, bathing beaches and other causes.

5. In spite of Federal laws and city ordinances,

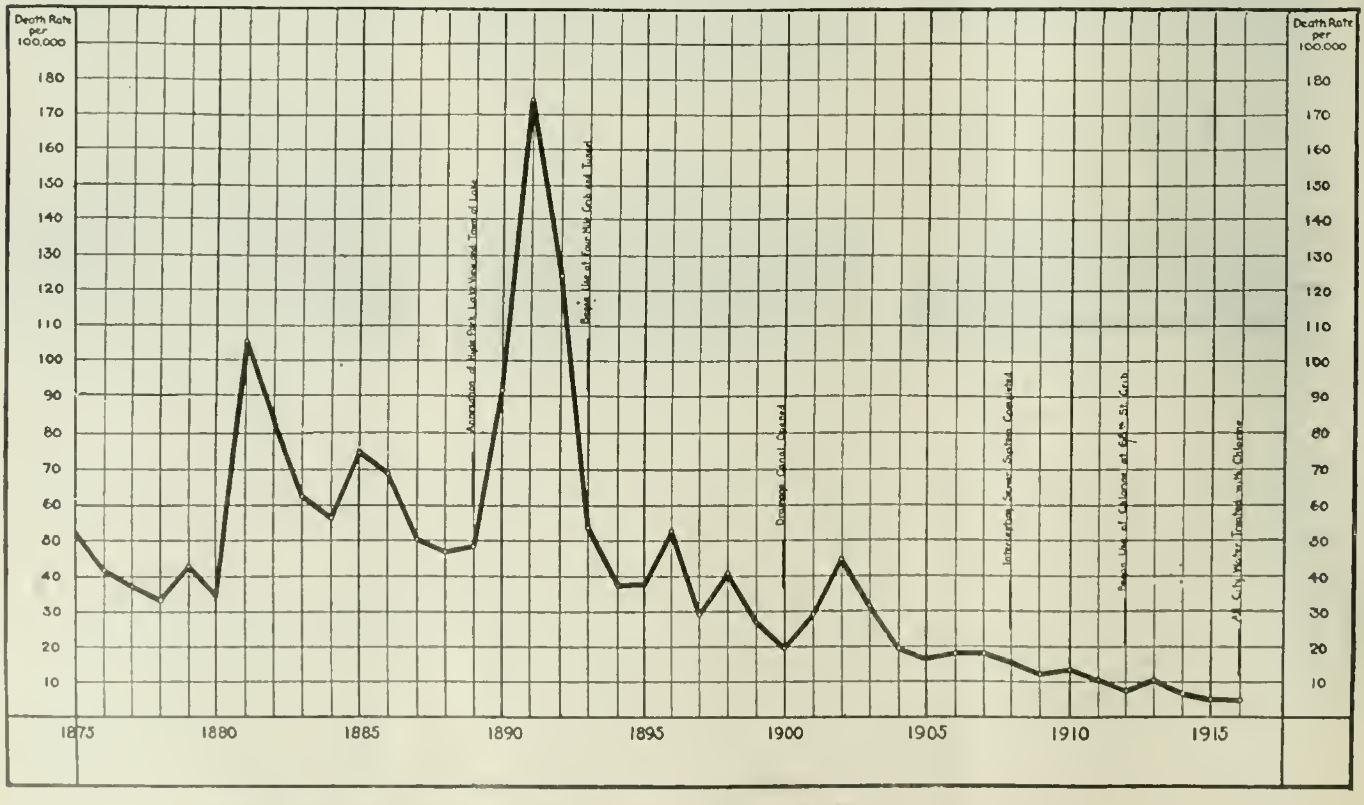


CHART SHOWING DEATH RATES FROM TYPHOID FEVER IN CHICAGO, 1875 TO 1916.

dredgings from the Chicago river are occasionally dumped into the lake sufficiently near shore to pollute the water supply.

6. Lake boats entering and leaving the harbor undoubtedly contribute polluted matter to the water in the vicinity of the intakes.

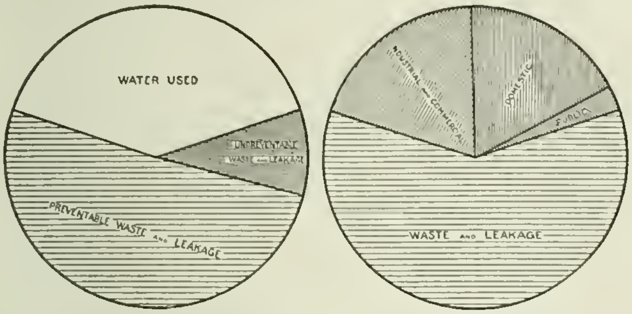
7. Storms frequently stir up the bottom of the lake, dislodging contaminating matter which may have been deposited there.

In addition to this pollution, the lake water is turbid or muddy at times, frequently noticeably so; the turbidity often reaching 60 or 70 in the scale of the standard methods of the American Public Health Association, which is ten times that considered permissible for the best water supplies.

The only plan for improving the purity of the supply which is recommended by the experts is filtration. This, of course, will add considerably to the expense of the supply, but by reducing the consumption to 40 per cent of that at present, the cost of filtering may be reduced by almost as great a percentage.

REDUCING WASTE.

In 1916, the amount of water reported as being pumped was equivalent to 259 gallons per person per day. (This includes slip, which the engineer has reported to be less than 3 per cent, although the bureau questions whether it is not in fact greater than 5 per cent.) In a general way, it is known that only about 40 per cent of the water pumped is consumed for any useful purpose, the remaining 60 per cent being lost through waste and leakage. Part of this is undoubtedly through leaks in mains and service pipes, as well as slip in pumps, but a large part is on the consumers' premises in the form of leakage from plumbing fixtures and wilful waste. It is estimated that this waste and leakage more than equal the combined water supply of Milwaukee, Boston, Cleveland and St. Louis.



WHAT BECOMES OF THE WATER PUMPED.

In the opinion of John Ericson, the city engineer, unless the waste is greatly reduced it will be necessary, within the next twenty years, to build four other major pumping stations with tunnels to supply them; to increase the daily capacity of three of the present stations by 50,000,000 gallons each; and to construct another tunnel to reinforce the existing system. The city has already spent $20,000,000 to $25,000,000 in increasing the capacity of the plant solely because of the waste of water.

Unmetered consumers in 1916 paid at the rate of 9.9 cents per thousand gallons, for the amount of water **used**, although the rate paid for all that was **taken** by them, including the waste, was only 2.6 cents. In other words, if the waste had been eliminated and the city had reduced its flat rates in the same proportion as the saving in consumption, they would have had to have paid only 2.6 cents per thousand gallons for the water used and would have saved 7.3 cents per thousand gallons.

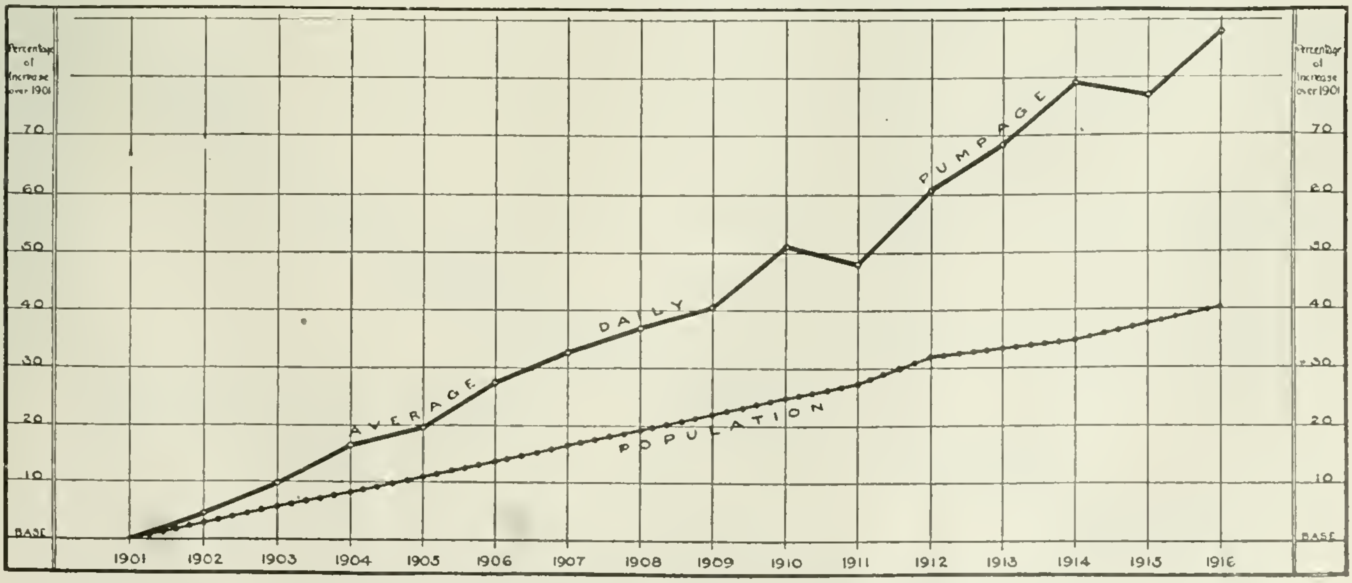
Not all of this unused water is wasted by the consumers, but it is certain that a considerable amount—how much, can only be estimated—leaks into the ground from defective water mains and services. Thousands of service pipes that have been run to the curb lines opposite vacant lots and have never been used are believed to be broken or leaking badly at the curb cocks. In addition, the mains themselves are probably leaking, owing to defective joints, electrolysis leaks, and other causes. The locating of these underground leaks, however, could, in the opinion of the investigators, be greatly facilitated if the waste in the houses themselves could be eliminated, thus permitting the approximate locating of the underground leakage.

HOUSE-TO-HOUSE INSPECTION.

The report considers two methods of controlling waste on the consumers' premises—frequent house-to-house inspections, and metering. It is believed to be easier to effect the reduction of this waste than of that underground, and that, following the practical elimination of this waste above-ground, the under-ground waste can be more readily located.

House-to-house inspection is a means of controlling waste and leakage which has not proven satisfactory in every respect.

In the first place inspections are never completely effective in checking waste, although they may do much toward reducing the loss from leaky and defective plumbing. There are several reasons for this.



GROWTH IN POPULATION AND IN AMOUNT OF WATER PUMPED, 1901 TO 1916.

Inspections do not affect to any considerable extent the losses due to careless or wilful waste. In fact, inspection may not reveal this kind of waste because it is intermittent and either does not exist or is discontinued at the time the inspector calls to examine the premises. Moreover, the consumer who carelessly or wilfully wastes water, even if detected by the inspector, will in most cases resume his wasteful tactics immediately after inspection, which therefore has accomplished practically nothing. This applies particularly to consumers who deliberately waste water through the open faucet, the hose, the hopper closet, and other flushing devices.

Neither do inspections as a rule detect and check leakage immediately. Unfortunately, premises where no leakage occurs one day may be among the worst offenders the next and, since the consumer has no incentive to make the necessary repairs immediately, a large amount of water may be lost before the next inspection is made and the leaks detected. Theoretically, such losses may be reduced to a minimum by increasing the frequency of the inspections. Practically, however, the cost of inspections places a limit upon the number which can profitably be made. Hence under the most effective inspection system practicable a considerable amount of preventable leakage is certain to exist.

Moreover, the effectiveness of the inspection is almost sure to be diminished by incompetence or lack of integrity of the inspectors, and the danger that wasteful consumers will obstruct and interfere with the inspectors in the discharge of their duties by the use of political pressure or otherwise.

Inspectors are expensive. Several years ago, the Bureau of Engineering employed this method to a considerable extent and found the average cost per inspection to be slightly in excess of one dollar.

Another serious objection to the inspection method is that no permanent relief is derived, the results obtained lasting only so long as the inspections are continued. During the six-year period beginning with 1908, Chicago spent approximately $420,000 in water waste survey and inspection work which, while it stopped considerable leakage temporarily, did not effect any permanent results.

People do not like to have their houses inspected. When penalties are enforced, they are more burdensome and expensive to the shiftless and wasteful consumer than is metering.

METERING.

Metering is recommended as being both more effective and more economical than inspection. In the absence of metering there is no inducement other than public spirit to conserve the supply. When water is paid for by meter measurement, however, the consumer has a universally effective inducement to prevent waste. The meter is on the job all the time and makes each consumer his own inspector, anxious to detect and checks leaks and to curtail waste.

Metering also secures permanent results. Once meters have been installed, there is no danger of waste and leakage being resumed. The inspection never relaxes because of changing administrations or policies.

In cities, and especially large cities, where metering has not been adopted, there is a strong popular objection to it. It is significant, however, that cities where meters have been introduced have not gone back to former methods, metering having proved satisfactory to both municipalities and consumers. Milwaukee and Cleveland are typical examples.

It is not necessary to repeat for the benefit of the readers of Municipal Journal all the arugments advanced in favoring of metering water supplies. They have been stated many times in this paper during the past few years. These arguments are discussed at some length in the report. It especially emphasizes the fact that meters do not restrict the legitimate use of water, providing, of course, that a minimum charge is made which will remove any inducement to save water below a certain reasonable minimum amount, as is the universal practice in metered cities. Metering does not increase water bills except in the case of those who waste water, but actually reduces the bills in the majority of cases. Water, like other public utilities and matters of all kinds obtained by purchase, should be charged for on the basis of the amount used.

Metering can be adopted as a universal practice, or it may be applied only to those services where waste is found or suspected. There are two principal objections to such selective metering, one being that it requires the use of the expensive inspection system to determine where the meters are needed; the other being that metering is applied only to those cases where it is anticipated that the water bills will be increased thereby, and therefore causes dissatisfaction wherever employed and is almost certain to cause a popular objection to metering. On the other hand, if meters are applied to all services, the majority of consumers will find their bills reduced thereby, and will become advocates of metering. Moreover, under selective metering there is always the probability that politics or favoritism may enable some of the offenders

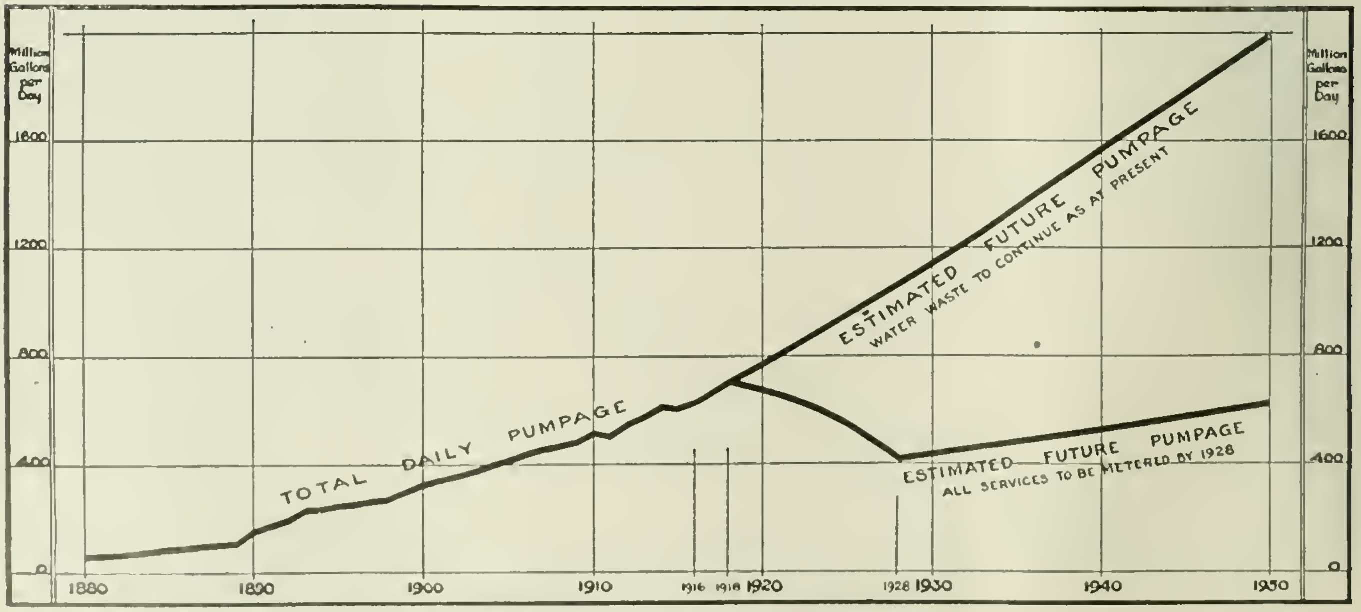


CHART SHOWING PROBABLE FUTURE EFFECT OF COMPLETE METERING UPON TOTAL DAILY PUMPAGE.

who should be metered to escape this method of being compelled to pay their just dues to the cities. The popular objection to metering in many of the large cities is probably due to the fact that most of such cities already have the selective plan in operation to a greater or less extent, and consequently all of those who have already been metered can apparently demonstrate by their own experience that metering increases water bills.

Before installing meters, owners should be required to put their plumbing in repair, since if this is not done, these owners will find their water bills increasing and thus become enemies of the system; whereas if they be required to eliminate leaks before metering begins, the comparison between the flat-rate bills and the meter bills will generally afford proof of the advantage of metering from the point of view of their own pocketbooks. In Chicago, and probably in most other cities with municipal plants, the water department already has authority to require the correction of leaks.

It is recommended in the report that meters be owned by the city and installed and maintained as a part of the waterworks plant, free of expense to consumers. This is believed to be the most efficient and economical plan to follow. An exception should perhaps be made in the case of meters installed on lines which supply free water for fire or other emergency purposes.

It is estimated that the cost of meters, including their setting, will average about $24 each. On this basis the aggregate cost of installing meters during the first ten years would be approximately $9,000,000. After all present services are metered, the annual cost of metering installations necessitated by the increase in population will be approximately $200,000. The annual cost of reading and repairing meters will average approximately $290,000 a year for the first ten years, and $575,000 per year thereafter.

ESTIMATED SAVING BY METERING.

Estimating the saving which would be effected during the thirty-three years beginning with 1918, if universal metering should be adopted, this is calculated as follows:

Additional capital amounting to $94,000,000 would be required for extensions in the absence of universal metering. The interest saved at 4 per cent would be $53,000,000; depreciation at 1 per cent would be $13,000,000; and the ordinary operating and maintenance charges would be reduced by $69,000,000; a total saving during the entire period of $135,000,000, or an average of more than $4,000,000 a year.

REFUSE DISPOSAL IN NEW ORLEANS.

Recent action relative to the disposal of garbage and other refuse in New Orleans is described in a recent communication to Municipal Journal by Edward E. Lafaye, commissioner of public property. Mr. Lafaye writes as follows:

"The city had about concluded to build a system of garbage incinerators, consisting of seven or eight units, located at different parts of the city of New Orleans, so as to minimize the length of haul. Through efforts of the Department of Agriculture, and because of certain data and information sent us at the psychological moment, we postponed definite action with regard to the building of high temperature destructors, and as a result of our further investigation on this subject, due largely to the changing conditions in the market value of the by-products of the reduction process, we decided to adopt, in lieu of incineration, a method of garbage disposal which provided for the combination means of disposition, embracing the reduction of all animal and vegetable matter by the Cobwell process, the utilization of all dry household waste of value, and finally, the destruction in high-temperature furnaces of all valueless refuse. The plant complete, embracing machinery necessary for the various methods of disposition, will cost approximately $1,200,000. It will handle the entire waste product and garbage of the city of New Orleans.

"Among the important features which brought about the conclusion on the part of the city to adopt the reduction process for animal and vegetable matter, in lieu of incineration, was the fact that we ascertained that the Cobwell process can handle such matter in a sanitary manner and without the numerous objections attendant to all other methods of garbage reduction."

WAR-TIME DISPOSAL OF GARBAGE

Comparison of the Advantages and Disadvantages of Reduction and Feeding to Hogs Under Present Conditions—Experiences of Other Cities.

The Joint Committees on Finance and Health have recently made to the City Council of Providence, R. I., a report on the subject of disposal of garbage that contains such timely ideas on the subject and is so admirably and concisely expressed that we are giving it entire for the information it contains and also as a model of form for a report of this kind. The report is signed for the commitees by Henry A. Grimwood, chairman of the Committee on Finance, and Gilbert R. Parker, chairman of the Committee on Health.

The Committees on Finance and Health which by City Council Resolution No. 312, series 1916, and by City Council Resolution No. 378, series 1917, were authorized to extend their inquiry and study of the question of the most modern and economical methods of providing for the removal of ashes and for the disposal of garbage and household refuse, beg leave at this time to present a statement of their investigations during the year 1917.

It will be recalled by the members of the City Council that in 1916 the Committee on Health, which had been making a particular study of the question of the collection and disposal of garbage, presented a report that dealt with its observations based on inspection of garbage plants at Boston, Staten and Barren Islands in New York, and Philadelphia and New Bedford.

It was practically conceded by the members of that committee that the investigation up to that point with relation to garbage indicated a marked tendency on the part of municipalities to dispose of garbage by the reduction process. Detailed information was submitted at that time with relation to the committee's investigations of the various reduction processes being utilized in the above mentioned cities, and also in other cities from which very exhaustive data has been obtained.

After the City Council had created the Finance and Health Committees as a special committee for the purpose of taking this whole question of waste disposal into consideration, it was decided that even the prospect of settling upon a reduction process for the garbage plant warranted a most thorough study particularly in view of the fact that the initial outlay for a plant is quite material, and in a growing community like Providence presents a factor which should be dealt with carefully on account of the necessity of meeting the situation whereby the taxpayer must in the final analysis pay a proportionate share for this new item of expenditure, particularly with relation to the ash question. It was brought to mind that gross revenue returns from the disposal of garbage by the reduction process were substantial, but there appeared to be no particular indication that the city of

Providence could possibly establish a plant and operate it without having the city bear an expense which would be much in excess of that now paid for the disposal of garbage by private contract, namely about $40,000.

Notwithstanding the fact that the members of the two committees were for some little time more or less favorable to the idea of proceeding in a definite way toward setting in motion the establishment of a reduction plant for the city of Providence. the abnormal situation which has arisen during the past year, and especially since our country's entrance into the war, has made this whole matter of waste disposal take on a somewhat new aspect. The necessity for utilizing all these waste materials is a matter that involves a conservation of resources, and at the least, an elimination of cost for the disposal of the garbage. if not the providing of means for having these waste food matters net a revenue.

The committees were confronted with a situation whereby the establishment of a reduction plant means excessively high cost for the equipment, with a further complication in that it is now a practical impossibility to procure the necessary machinery to set up a modern plant. The committees' recent visit to Chicago most emphatically illustrated this point. There, a plant upon an elaborate scale has been laid out and partially put into operation and for a number of months past it has been impossible for the officials to procure some of the machinery essential to the complete operation of the system. The special character of the machinery makes it necessarily expensive, and at a time like the present the cost of a reduction plant is practically prohibitive.

Utilizing the garbage by transforming it into pork by having the city itself set up and operate a hog farm, was a thought that at first struck the members of the committee with a feeling of much concern. It was recognized that at the present time the city is having its garbage taken care of by a private contractor, who either by his own organization or by means of farmers to whom he disposes of the garbage, has the city's waste in the food line fed to hogs. It was also recognized, as it has been for some little time, that the continuation of this arrangement is a matter which cannot be considered a permanent one. It is possible that it may be continued for some little time. But the city must be prepared with full information as to the means of taking hold of the situation in case the present arrangement is discontinued.

It was with particular benefit to the members of the committee therefore that recently a visit was made to Denver, Colorado, where an inspection was made of a hog farm, so called, to which all the garbage from the city of Denver is transported. It is operated by a private corporation that has been dealing with the city for about ten years. It has cost the municipality nothing during that period for the collection and disposal of its garbage. Even in contrast to some of the very modern reduction plants which the committee has inspected, this hog farm gave no evidence whatever of being a nuisance. It is situated only a short distance outside the city limits, and there are no offensive odors whatever. The equipment is maintained in good order, and the capital expenditure appears to be comparatively small as against what it will cost to establish a reduction plant. When it is also considered that savings are effected in this way, and at the same time the natural resources of the country, such as the raising of hogs, is enhanced, it would appear to the members of your committee to be a particularly proper venture during the present period.

The members of your committee realize that it is not good judgment for the city to inaugurate any new projects that are not absolutely necessary and essential to the proper conduct of the city's business. So long as the present situation with regard to the disposal of garbage is capable of being continued, there appears to be no good reason for effecting any change. It is deemed wise, however, that the experience of these other cities that are successfully coping with the garbage situation should not be lost sight of, and the intention of your committee is to continue its inquiry with respect to the feeding of garbage to swine, particularly with the object in mind of seeing if it is not possible to have a hog farm established, either by the city or by a private contractor, whereby the cost to the city at the present time may be diminished.

With respect to the ash situation, the members of your committee are convinced from observation that this is a direct expense that is bound to be a means of increasing the burden upon the taxpayer, even though an incinerating plant is established. At the present time each householder makes his own arrangement for the disposal of ashes. It may be desirable in the future for the city to take over the general care of ashes and their removal. It will cost money to do this, however, and the taxpayer must pay the bill. The need for the city's disturbing the present arrangement of the matter at its disposal is not urgent. It can wait for such time as conditions are more favorable to inaugurate new ventures for municipal activities. Members of the committee have secured much valuable data with regard to the removal of ashes in other cities, and have definite ideas as to just what procedure is to be taken when ashes are to be removed under city direction. The present is not the time however to seriously consider the question of having the city remove ashes.

(*To be continued.*)

STREET REPAIRS IN COLUMBUS, O.*

Amount, Kind and Cost of Stone Block, Cobble and Macadam Repairs—Itemized Costs of Four Years' Work—Unit Prices.

By CHARLES CARROLL BROWN.

STONE BLOCK AND COBBLE STONE.

A small amount of stone block and cobble-stone repair was done, viz. 985 patches of the former and one of the latter. The 1,376 sq. yds. of stone block cost $1,095.46 for labor, 79.6 cents a sq. yd., and $222.97 for material, making the total cost $1,318.39 or 95.8 cents per square yard. No new blocks were used, the old blocks being relaid.

The 14 sq. yds. of cobble stone repair cost $25.99 for labor and $2.05 for material, or a total of about $2 a square yard.

MACADAM.

The patching of macadam streets is itemized as to kind of treatment and quantity of materials, but not as to yardage or cost per square yard.

For macadam with bituminous binder, if it is assumed that the average thickness of patches is 4 inches, the 246.75 tons of broken stone used would lay about 1,700 sq. yd. of repairs. 787 gallons of K. P. Tarvia were used and 1,100 gallons of asphalt binder, which would amount to more than one gallon a sq. yd, if the above assumption of average thickness per square yard is correct.

The broken stone cost $193.44, or 78½ cents a ton. The 787 gal. of Tarvia cost $193.44, or 15¾ cents a gallon. The 1,100 gal. of asphalt binder cost $70.50 or 6.4 cents a gal. The 325 gal. of oil used cost $18.68 or 5¾ cents a gal. The labor cost of the bituminous macadam repairs was $727.76 or 66 cents a square yard, if the yardage repaired was about 1,700, as above computed.

In water-bound macadam repairs, 1,918.85 tons of broken stone were used, which would cover 3,300 sq. yd.

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*Concluded from page 94.

The cost of the broken stone was $1,396.15, which is 73 cents a ton or 10½ cents a square yard of the assumed area repaired. The labor cost was $1,402.95 or 10½ cents a square yard. Spiking cost $10, and rolling $780, $600 of this cost being on one street. The total cost of macadam road repairs was $3,589.14 or 27 cents a square yard.

A small amount of macadam street was repaired with stone chips and Tarvia, using 31.2 tons of stone and costing $144.02. With the same assumptions as above the area repaired is about 215 sq. yd., and the cost per square yard about 66 cents.

A small area was repaired with glutrin and another with emulsified oil, each costing about $15.

Some streets were treated with Tarvia. Of Tarvia A 2,359 gal. were used, costing 9 cents a gallon and 1,165 gal. of Tarvia B, costing 8 cents. Slag was used for filling holes and low spots, the 82.34 cu. yd. costing $1.35 a cubic yard. Labor cost was $174.34 and rolling cost $45.00.

If ½ gal. of Tarvia was used per square yard, the area covered was 7,048 sq. yds. The total cost for labor and materials was $590.19 or 8.4 cents a square yard.

Of Tarvia X, 3,841 gal. were used, applied hot, costing 9 cents a gal. Under the same assumption as above of ½ gal. per square yard, this would cover 7,682 sq. yd. About 200 cu. yd. of slag and broken stone were used, the former costing $1.34 per cubic yard, and the latter 82 cents a ton. Labor cost $156.55 and rolling cost $80. The total cost was $737.18, or about 9.6 cents per square yard if the above assumption is correct.

Twenty-two streets were oiled by the street repair department, using 8,063 gallons of oil, costing $383.17, which, with $101.11 cost of labor made the total cost $484.68. If 1/3 gal. of oil were used, the surface treated was about 24,000 sq. yd. and this total cost per square yard was 2 cents.

The street sprinkling service oiled 23 streets, making from 2 to 5 applications during the season, or 66 applications in all. The total area covered by the sprinkling was 57,896 sq. yd. and 18,532 gal. of oil were used, 0.32 gal per square yard, costing $1,079.92, or 5.8 cents per gallon, so that the oil cost 1.8 cents per square yard. The labor cost was $434.49 or ¾ cent a square yard. A few cubic yards of sand, gravel and broken stone were used on five streets so that the total cost of labor and materials was $1,551.81 making the average cost 2.6 cents per square yard treated. On the 23 streets treated the amount of oil used varied from 0.22 to 0.55 gal. per square yard, averaging 0.32, and the cost for oil varied from 1.2 to 3.1 cents, averaging 1.8 a square yard. The labor cost varied from 0.14 to 1.5 cents per square yard, averaging 0.75 cent, and the total cost per square yard ranged from 1.4 to 5.4 cents, averaging 2.6 cents.

COMPARISONS WITH FORMER YEARS.

The cost of repairs, and particularly the yardage requiring repairs, depends upon whether the repairs are kept up to date. A number of years of neglect of repairs will necessitate large repairs in the year when they are brought up to date.

Following is the yardage of brick and stone block pavements repaired in each of the past six years:

Year	Yards of brick and stone pavement repaired.	Per cent increase or decrease.
1911	26,025	...
1912	42,930	64.9 I
1913	35,539	17.0 D
1914	29,572	16.8 D
1915	63,116	53.0 I
1916	11,610	81.6 D

The decrease in repairs in 1916 was due to a lack of funds, and the complaints of defective streets in 1917 were a direct result of the failure on this account in 1916 to keep up all the repairs needed that year.

The accompanying table giving the results of the operation of the repair of brick and stone block streets contains much interesting information if it is used as a guide for estimates in other repair departments and as a form for making possible comparisons with the operations in other cities and of the results in different years.

Details of Cost of Brick and Stone Street Repairs in Columbus, Ohio.

Items.	1913	1914	1915	1916
Number of patches	10,317	13,677	33,680	3,291
Sq. yds. in patches	35,539	29,572	63,116	11,608
Sq. yd. per patch	3.44	2.16	1.88	3.54
Cu. yds. sand used	1,270	911	1,875	327
Cost of sand	$1,090.25	$812.96	$1,687.23	$293.33
Cost of sand per cu. yd.	$0.86	$0.89	$0.90	$0.90
Cost of pitch and tar	$3,940.55	$2,526.41	$6,090.47	$858.11
Cost of cement	$39.71	$121.64	$150.61	$55.68
Cost of tools, etc.	$654.05	$675.88	$1,131.47	$381.56
Total cost of adjunct materials	$5,724.56	$4.136.89	$9,059.78	$1,588.70
Cost of adjunct materials, per sq. yd.	$0.162	$0.14	$0.14	$0.14
Cost of labor	$26,371.24	$21,602.30	$42,994.76	$7,844.40
Cost of labor, per sq. yd.	$0.74	$0.73	$0.68	$0.68
No. of bricks used, old.	246,089	239,469	286,204	88,672
No. of bricks used, new.	103,548	130,072	444,694	26,236
Cost of new bricks	$1,636.82	$2,261.63	$7,141.80	$460.81
Cost of brick per M	$15.80	$17.30	$16.10	$17.55
No. of blocks used, old.	963	1,164	15,101	4,663
No. of blocks used, new	21,399	7,412	2,653	....
No. of blocks, Hayden.	38,797	57,047	16,760	3,045
Cost of new blocks	$1,547.32	$538.58	$128.60	....
Total cost of bricks and blocks	$3,184.14	$2,800.21	$7,270.40	$460.81
Cost per sq. yd. repaired	$0.090	$0.095	$0 115	$0.040
Total cost of repairs	$35,279.94	$28,539.40	$59,324.95	$1,940.05
Total cost per sq. yd. repaired	$0.99	$0.965	$0.935	$0.86

The amount of stone repair is so small as to be practically negligible in the totals and averages.

The variations in activity are indicated by the first two items, number of patches made and area of those patches. The effect of this activity is shown in the average area of each patch in the third item. In 1915, when a large amount of work was done, large and small holes were patched and the average area of patches is small. In 1916, when the amount of work was greatly curtailed on account of lack of funds, the larger breaks naturally were repaired first and the yardage per patch is therefore quite large. The same was true to a less extent in 1913 and 1914, there being a 20 per cent reduction each year from the area repaired the year before. It will be noted that in 1914 there was a 30 per cent increase in the number of patches, though there was a 20 per cent reduction in the area. This suggests that the amount of repair done in 1914 was approximately the proper normal amount for streets of the age they had that year; whereas the figures for 1915 indicate greater attention to repairs than the normal and those for 1916 much less than the normal.

The cost of materials other than brick is quite constant and the variation in cost of labor is small, computed per square yard of repairs.

The cost of the bricks and blocks varies considerably on account of the variation in the number of new bricks bought. Thus in 1913 the number of old bricks and blocks used was 247,052, which is 60 per cent of those used, including Hayden blocks. In 1914 it was 240,632 or 55 per cent; in 1915, 301,305, or 39 per cent; in 1916, 93,335, or 76 per cent. This accounts for the low cost of brick per square yard of patch in 1916 and for the low total cost of patching per square yard. The higher cost of labor in 1913 and 1914 accounts for the higher total cost in those years. By making such comparisons as these the weak spots in the management can be picked out and the effect of possible savings is visible.

A table of unit prices paid for labor and materials aids in making the comparisons accurately. Following is the table for Columbus:

Wages, Cents Per Hour.

	1913	1914	1915	1916
Head foreman	50	50	50	50
Foreman	43¾	43¾	43¾	43¾
Pavers	37½	37½	37½	37½
Assistant pavers	30	30½*	31¼	31¼
Rammers	28⅛†	28⅛‡	30	30
Laborers	28⅛§	28⅛	28⅛	30
Teams	60¶	55 5/9	55 5/9	55 5/9

Cost of Materials Per Unit Named.

	1913	1914	1915	1916
Standard pavers, per M.	$16.75	$16.75	$16.50	$16.50
Old style pavers, per M.	16.75	17.25	17.00	18.25
Pitch, per ton, f. o. b. yard	11.00	11.50	11.00	9.51
Sand per ton	0.85	0.85	0.85	0.85
Macadam, per ton, range	0.60 0.725	0.70 0.80	0.559 0.669	0.71 0.83
Stone dust, per ton, range	... ...	0.55 0.65	0.559 0.669	0.71 0.83

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*30½ for first half; 31¼ for second half of season.

†27½ for one month; 28⅛ for remainder of season.

‡28⅛ to 30.

§25 for one month, 28⅛ for remainder of season.

¶50 for one month; 60 for remainder of season.

EFFECT OF WAR ON GARBAGE DISPOSAL.

In a paper before the American Public Health Association, I. S. Osborn, head of the Division of Utilization of Food and Household Wastes of the United States Food Administration, discussed the effect of the war on the production and disposal of refuse. Sixty cities showed an average reduction of 12 to 15 per cent in the amount of refuse collected during nine months of 1917; and the amount of grease per ton of refuse also showed a reduction of 15 per cent, or a reduction of grease per capita of 25 to 30 per cent.

"Until recently there has been a strong tendency towards incineration, especially among the smaller cities. This method, in nearly every case, has been followed at considerable expense to the municipalities, both for installation and operation, with no returns except in the very few cases where power has been developed—but in most instances the cost of power development has been greater than the revenue obtained.

"There is now a strong tendency to adopt some method of refuse utilization instead of incineration. Refuse piggeries will be found desirable in many cities. Each thousand population produces food waste sufficient to fit twenty-five hogs for market. In the smaller communities no other method of refuse disposal will show returns as desirable from an economic viewpoint as feeding refuse to pigs.

"For the larger cities, no doubt, refuse reduction will prove to be the most advantageous method. The decrease in quantities of by-products will to a large extent be offset by their increased values, and at the same time there will be a tendency to recover additional by-products that now are lost.

"There is an ever-increasing demand for the tankage produced from refuse, for use in the manufacture of fertilizer. The price of nitrogenous fertilizer is determined by the available nitrogen. The old form of tests showed a low available nitrogen in refuse tankage, but the soil tests now made by the United States Department of Agriculture show that the material decomposes readily, affording a rapidly available nitrogen supply.

"The values of the by-products from the existing refuse reduction plants, at present prices, will amount to $8,500,000 for grease and $2,250,000 for tankage. From the tankage can be produced annually about 9,000,000 pounds of nitrogen, 25,000,000 pounds of bone phosphate lime and 2,500,000 pounds of potash. The grease that is recovered is split up into various by-products, the glycerine content being the most valuable. From the refuse grease produced in the plants operating in the United States, 8,000,000 pounds of nitro-glycerine can be extracted, and still leave grease from which can be made approximately 200,000,000 12-ounce cakes of soap.

"There is a great shortage of the materials that can be produced from refuse. Utilization is not solely a question of profit. Every community should utilize its wastes and make available from this source everything which may be gained thereby for the country's needs."

SANTA MONICA SELLS GARBAGE.

Santa Monica, Cal., in January closed a contract with the Pacific Hog-Raising Co., which is owned by Japanese, for the purchase of the city's garbage at a price which is believed to be the highest ever paid in the United States. In accordance with this contract, the city is to receive $18.90 a ton for its garbage. Another bid was received from a Los Angeles party of $17.18 a ton. Last year the city received only $1.60 a ton. The Hog-Raising Co. operates a hog ranch in the Santa Monica mountains within three miles of the city, where it raises several thousand hogs.

BELIEVES IN CITY MANAGER GOVERNMENT.

The following letter has been received from an official (not the city manager) of a city which has had the city manager form of government for several years and who modestly has requested that we do not publish his name. He expresses the opinion, in a footnote, that this form of government is applicable to cities with populations of from five thousand to fifteen thousand.

Editor of Municipal Journal, New York City:
Dear Sir:

I am a reader of your Journal, and being a student of municipal affairs, have given special thought to the general manager plan of city government. My home being in a city where the business of the city is in the hands of the city manager, I have made comparisons, and have reached the conclusion that it is the best form of city government, and it is a surprise to me that other people who pay the expenses of the city government do not demand the manager form. Recently I visited many cities and, as far as able, I gathered information concerning the government of them. In the few cities which had the manager form it was easy to get information, but the same was not true where the old council form was in vogue. I was surprised at the number of people coming into direct touch with the manager, in fact, the office seemed to be a clearance house where charity was administred to the needy, disputes between neighbors were settled without resorting to the courts, and, most important of all, the relations between city and citizens were made so plain that many persons going into the office with a grievance left with a kindly thought of their duty to the city. If a citizen thinks of his relation to the city as a member of large family in which he is vitally interested, you would not hear that oft-repeated threat, "I will sue the city," "Wish I could sell out and leave," and other similar remarks. It is not the duty of the city manager to save money like a miser by hoarding it or putting it out on interest, but rather to get results. The American public cares very little about the amount expended, but they demand improved services. It is not the city's duty to pay a dividend in money, but in service rendered. This can best be accomplished by the city manager form of government with the manager clothed with authority to manage.

A great deal depends on the man selected to fill the office. He should possess good sound business judgment. He should be practical, as a large portion of the city's affairs are practical in operation. He should be affable and a man of easy approach and good address, and well-versed in city affairs. After the manager has been selected, he should have the united support of the entire community, and better service to a marked degree will take the place of the old sluggish council and committee neglect.

Speaking from experience, I feel that one of the greatest hindrances is the reluctance with which other members of council relinquish their authority after they have selected the manager. Kicks? Yes, you will have lots of them; but improved methods, good results and better service will wear the kicker out.

Yours very truly,
ONE WHO HAS LIVED UNDER BOTH FORMS OF CITY GOVERNMENT.

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Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

KEEPING THE ROADS OPEN.

Subsequent to the publication last week of an editorial on this subject, we learned of several instances in which officials have realized the importance of keeping the main highways in such condition that the snow will not interfere with motor traffic. In Ohio the state department sent urgent calls a few days ago to certain county officials to make the roads passable where the snow had drifted badly, an imperative reason being that government trucks on their way to France *via* Atlantic seaports were being seriously impeded. The commissioners were considering the use of prisoners from the county jail for the purpose.

In New York state the same necessity existed on the roads between Buffalo and New York, and other roads leading to the several military camps. Near Buffalo and Madison Barracks, along the shore of Lake Ontario, it seems impossible to keep the roads shoveled out, and highway engineer Charles C. Cassell has proposed using a caterpillar tractor to pack down the snow instead. It is believed that this would be much cheaper and more lasting than digging out the snow, which costs $250 per mile per month.

Pennsylvania is keeping two hundred and fifty miles of highway cleared of snow for the army trucks, this being done by the Maintenance Division of the State Highway Department, using various kinds of appliances and methods. Its operations will be described next week. A large part of the distance kept open comprises a section of the Lincoln Highway. The first endeavor to keep this highway open across Illinois was recently made on the road between Aurora and Geneva, where a snow plow drawn by horses was used, aided by gangs of men with shovels.

With a determination to keep the roads open to traffic, there is no doubt that new methods and contrivances will be devised. Packing the snow with rollers has been practiced for years in city streets in New England. There would seem to be no reason why a rotary snow excavator, similar to those used by the railroads, could not be carried and operated by a motor truck; and other ideas will suggest themselves. The important thing is to realize that main routes should be kept open. In addition to this, is the consideration that the interest and sinking fund on the cost of such a road amounts to $8 to $12 per mile per day, on the average, and that this value is being lost to the community every day that the road is impassable.

CONSERVING COAL AND WATER.

The deputy water commissioner of Cleveland, O., has informed the water consumers of that city that the water they waste requires a car load of coal a day for pumping—and a car load of coal is a whole lot these days. Chicago uses needlessly six car loads a day in the same way. And almost every city in the country that pumps its water supply wastes fuel by wasting water. This is true whether it pumps by steam, gas or electricity. Conserving fuel is as important as conserving food just now, and the federal authorities report that the fuel shortage will probably continue for at least another year.

Many of the cities are realizing this, reports reaching us from all over the country of warnings to citizens against this indirect waste of coal by wasting water. One instance is Erie, Pa., a large display notice that appeared in a daily paper of that city recently being reproduced below:

SAVE YOUR MONEY
BY
Saving Your City Water

The City Water Department belongs to the Citizens of Erie, and any saving that the Citizens make in the consumption of water conserves the taxpayers' money.

All water now used in the City is filtered. It costs money to filter the water and coal is high.
Therefore, SAVE WATER.
Don't leave the faucet running to prevent freezing.
Turn off the water in the cellar at night.

Don't leave the faucet running in the house longer than is necessary.
Report any leaks.

Recent inspection by the Water Department indicates that a saving of at least five million gallons (5,000,000 gallons) of water a day can be effected by the water takers keeping the fixtures from leaking. This means $40.00 per day, easy. Shut off and drain the supply to your sprinkler connections before they freeze up and burst.

SAVE THE WATER

By Order of Commissioners of Water Works in the City of Erie.
GEORGE C. GENSHEIMER, Secretary.

The Frankfort, Kentucky, fuel administration urges the citizens, through the daily papers, to "Save in Coal by Reduced Use of City's Water." It is estimated that it costs Chicago nearly $12,000 a day to furnish the wasted water, as is described in the leading article in this issue. The country at large is probably wasting more than twenty-five million dollars a year in this way.

But most important just now is the coal. Hundreds of thousands of families, during this winter of unprecedented cold, are without coal for days at a time—some of them for weeks. And meantime thousands of tons a day are being used to furnish water to wasters. Such waste is as criminal as throwing bread and meat into the garbage pail, and city governments would be justified in taking drastic measures to prevent it.

The WEEK'S NEWS

U. S. Government's Attitude Towards Road-Building—Texas Reorganizes Highway Department—New Jersey's Roac Tax Law Developments—Uniform Road Marking—Harrisburg Has Water Famine—New Jersey Public Service Commission Reduces Gas Standard for U. S.—Scranton and Asheville Give Policemen Higher Pay—New York Has Woman Deputy Police Chief—Three Philadelphia Firemen Killed—New City Managers in Madill, Okla.; Denton, Tex.; Boulder, Colo., and Auburn, Me.

ROADS AND PAVEMENTS

Road Building Policy of Federal Government.

Washington, D. C.—Secretary Houston, of the Department of Agriculture, in a communication to the American Association of State Highway Officials, recently set forth squarely the policy which he thinks should be followed in highway construction during the war. Secretary Houston says: "So far as it is practicable to do so, this department will urge the maintenance of the highways already constructed; the construction and completion of those highways which are vitally important because of their bearing upon the war situation or for the movement of commodities; the postponement of all highway construction relatively less essential or not based upon important military or economic needs. The department is preparing to suggest to the state highway departments the preparation of a schedule of work for the Federal aid projects for 1918 in line with this policy." In carrying out the policy thus announced there have been sent out by the Office of Public Roads of the Department of Agriculture schedule forms on which the states are requested to set forth their proposed Federal aid work for the 1918 working season. These schedules call for a description of each road, the character, quantity, and rail haul of the materials to be used, the probable cost, the amount of Federal funds desired, the specific purpose of the improvement, its bearing upon the war situation, and what effect a delay of the work until 1919 or later would have. With the information thus assembled and classified, an efficient road construction program is assured. While it is impossible to make any definite statement regarding the transportation of road materials, the expectations are that the transportation situation will be improved and that the shipment of such materials for essential projects can be made. Road construction and maintenance in the United States involve an annual expenditure of some $300,000,000, and there is scarcely a section of the country that is not seriously affected by a marked disturbance in road work.

State Highway Commission Reorganized.

Austin, Tex.—The members of the Highway Commission resigned recently in a body and the commission has been reorganized by the new members appointed by the Governor. According to chairman Curtis Hancock, he tendered his resignation because of "a difference in the commission as to a matter of policy. There were three viewpoints advanced by the members of the commission as to the administrative duties of the department in the absence of the commission. The question arose as to the organization of the department—whether the duties of the department during the absence of the commission should be wholly in the hands of the engineer, or whether it should be wholly in the hands of a secretary, or whether it should be divided into two departments and the secretary be given the administrative duties over the automobile registration bureau and the engineer over the road building bureau. My opinion was that the law conferred the administrative duties upon the highway engineer during the absence of the commission and that he should be head of the department. One of the commissioners took the position that the secretary should be the head of the department and the question was temporarily settled by a compromise, making the engineer head of his department and the secretary head of the automobile registration bureau. When the secretary's term of office expired by limitation, he having been employed only up to January 1, the matter was open again for adjustment, and there could be no agreement, so the commissioners tendered their resignation." In the reorganization of the state highway commission under the new members, commissioner J. G. Fowler of San Antonio was made commissioner of registration, and commissioner R. H. Hubbard of Bowie, Montague county, was placed at the head of the highway department, while chairman Hancock will have general supervision over various departments. At the first meeting held of the new commission, it abolished the position of secretary, thus saving the state the sum of $3,000 annually which had heretofore been paid for the services of a secretary. The old commission has also dispensed with the services of a secretary and the new commission ratified this action. The duties of secretary will devolve upon Charles A. Duren, the chief engineer of the commission.

The central legislative investigating committee has adopted the report of representative Sentell on the investigation made of the state highway department. The report recommends the placing of the state highway department under the railroad commission; that the three offices of the highway commissioners as now exist be abolished and that one man be placed over the entire department. In other words the central committee shall recommend to the legislature that the highway department shall be a one-man affair, and that man be appointed by the railroad commission, and this commissioner shall devote his entire time to the supervision of the department, and that he shall be subject to and report to the railroad commission; and his appointment be confirmed by the senate. "We believe that the policy of three appointive heads of equal powers for the management of a department, such as is that of the highway department, at present is a failure and a bad policy," said Mr. Sentell. Senator Hopkins wanted to amend the report so that the governor shall appoint the commissioner instead of the railroad commission, but this amendment was rejected. It is also recommended in the report that the salary of the chief engineer shall be fixed at $4,000 a year; at present the chief engineer receives $5,000 a year. Senator Hopkins obtained the adoption of an amendment that members of the highway commission shall not in the future make trips over the state making political speeches, and charge the expenses to the state. It is further recommended that the present force in the highway department be materially decreased.

Untangling New Jersey's Road Tax Law.

Trenton, N. J.—Dismissing an appeal of the Erie Railroad Company, attacking the constitutionality of the Edge road tax act, the State Board of Taxes and Assessments has handed down a decision holding that the first and fourth classes of railroad property are not subject to the road tax act, but that, by reason of the peculiar plan of taxation applicable to them, their taxes are increased automatically by the operation of the act. The opinion pointed out that such increase has been anticipated by the Legislature and appropriated to the road fund. The railroad's appeal included the assessments on first, second and fourth class property, since which time, however, the Supreme court has decided that second-class property is taxable under the Edge act. This decision eliminated consideration of this class of property by the tax board. The opinion of the tax board pointed out the method employed in taxing such property on the basis of the average tax rate in the state. The opinion then continued as follows:

> "It is obvious of course that the inclusion of the road tax in the local rate operated to increase the average rate of taxation. It follows, therefore, that the taxes imposed upon first and fourth class railroad property have been correspondingly increased. This results from the method prescribed by the legislature for computing the average rate of taxation. It is entirely consistent with the opinion of the supreme court that the first and fourth classes of railroad property are not subject to the road tax act.
>
> "Manifestly, all that that opinion establishes is that railroad property of the classes we are discussing does not come within the classification of the road tax act, and that it would therefore be unlawful to impose upon this property the road tax in addition to the average tax rate. To argue that because the railroad property in question is indirectly obliged to pay its share of road taxes, it is thereby subjected to taxation under the road tax law, is to question the validity of the judicially approved method of taxing this class of property.
>
> "Such property, for example, is not subject to the state school tax, but that tax helps to make up the rate of taxation in each district, and therefore is reflected in the average tax rate. First and fourth class railroad property is subject neither to local asssment nor local taxation, and yet the tax rate for local purposes is an important factor in determining the amount of taxes such property must pay to the state.
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> "It will be seen, therefore, that the appropriating act of 1917 was necessary to insure the diversion to the road fund of the increase in railroad taxes effected by the road tax scheme."

Supreme court justice Swayze has granted writs of certiorari to the various railroads making up the Pennsylvania Railroad system in this state for a review on the constitutionality of the Edge road tax act. The companies contend that it is erroneous and contrary to law to include the tax to be collected on first, third, and fourth class railroad property of one mill on each dollar of valuation. After the writs were granted, the Pennsylvania Railroad Company turned over to state treasurer Read $2,460,236, representing the tax levied against its property minus $79,689 assessed for the road tax on the first, third, and fourth class property. Meanwhile receipts from the Edge road tax actually turned into the state treasury by January 25 totalled $1,482,788.76. This included full returns from fifteen counties and partial payments from two others. Four counties, including Essex, had not made any payment to the treasury. Hudson County sent in a check for approximately $169,000 as a partial payment on account of the road tax and has notified the state controller's office that more will soon be forthcoming. The tax in Middlesex has been held up by the freeholder mixup and the refusal of banks to honor checks of the county collector. Remittances from Warren have been delayed by the tangle which resulted in the suspension of the operation of the taxing machinery of that county.

Short Highway Engineering Course in Illinois.

Urbana, Ill.—The annual short course in highway engineering was recently held here and drew a large attendance of road engineers, superintendents, commissioners and contractors. Among the lecturers in the course were S. E. Bradt, state superintendent of highways; Clifford Older, chief engineer; H. E. Bilger, state road engineer; Prof. F. H. Newell; Prof. Ira O. Baker; Prof. D. A. Abrams, Lewis Institute, Chicago; Frank T. Sheets, assistant maintenance engineer; B. H. Piepmeier, maintenance engineer; Prof. S. W. Parr, G. F. Burch, acting bridge engineer, and Col. L. D. Wildman, U. S. A. Among the subjects discussed were: Financing, military necessity, foundations for piers and abutments, drainage, surveying instruments, concrete, brick, maintenance, bridges, earth, gravel and macadam, oils, tars and asphalts, painting and maintenance of bridges, bituminous roads. A number of highway laboratory sessions were held. The meeting was held jointly with the Illinois Highway Improvement Association.

Urge Uniform Road Marking.

Trenton, N. J.—Arrow-shaped signs for road markers are recommended for New Jersey in a report just made to the State Association of County Engineers, a copy of which was forwarded to the state highway commission by the association's highway sign committee. The report is the result of a survey of states east of the Mississippi river, and the form of marker selected as the most desirable is that now in use in Connecticut. The members of the engineers' committee are R. P. McClave of Bergen County, Thomas Wasser of Hudson County and George Cooper of Monmouth County. In its report the committee says no attempt may be made to establish a national standard for road signs, but that it believes some consideration should be given the future use of the markers and that the best obtainable designs should be adopted. Some regulation of advertising signs, used for road markers, is also desirable, the committee believes. It finds some of these signs give excellent service, but favors giving official markers preference, with those privately owned, if acceptable, given secondary positions on the roads. The arrow sign recommended conspicuously carries the name of the most important town on the route and the two towns nearest the sign in smaller, but legible, lettering. Eight of the states with which the committee communicated are ready to cooperate in a movement for standardized signs. They are Connecticut, Delaware, Florida, Illinois, New Hampshire, North Carolina, Virginia and Wisconsin.

Court Holds "Closed" Specifications Legal.

Montclair, N. J.—Upholding the award of a contract for paving an avenue in this city, the supreme court has decided that a requirement in the specifications for a patented road material was legal, inasmuch as the manufacturers had filed a certificate stipulating the price at which the material could be purchased by any bidder. Certiorari proceedings had been brought by property owners attacking the action of the Montclair Town Commission in awarding the contract to the Standard Bitulithic Company. In the first instance the contract was awarded to the Standard company, although it was not the lowest bidder. This award was subsequently set aside and bids were readvertised for, in which warrenite was specified. The contract was again awarded to the Standard company, which was then the lowest bidder. The second award was attacked on the grounds that twenty-five per cent of the special benefits would be assessed against the complainant, that the awards did not specify the time within which the contract was to be completed, and that the specifications required a patented road material.

SEWERAGE AND SANITATION

Fear Epidemic of Spinal Meningitis.

Charlotte, N. C.—As a precaution against an outbreak of spinal meningitis, the city commission issued an order closing all places of amusement, churches, reading rooms and libraries and prohibiting any public gathering in the city of Charlotte for a period of two weeks. General J. T. Dickman, commanding Camp Greene, also issued an order prohibiting officers and enlisted men in the camp entering the city during the period without special written permit from commanding officers "for necessary purpose." The order was promulgated in a proclamation, issued by mayor F. R. McNinch, who pronounced the situation "grave," although there were only six cases of meningitis in the city, he said.

Sewage Disposal Plant Not Subject to Taxation.

Trenton, N. J.—Reversing in part a decision of the state tax board, the supreme court has held that the lands and buildings constituting the sewage disposal plant, used jointly by Plainfield, North Plainfield and Dunellen, is not subject to taxation. The property was assessed for taxes for 1915 and 1916 by the borough of Middlesex, where it is situated. The assessment was upheld by the Middlesex County tax board, but was modified by the state board to the extent of exempting the buildings and so much of the ninety-acre tract as actually was used for the filtration beds. In this decision the state board followed largely the reasoning of decisions under which charitable and similar institutions are entitled to exemption on buildings and so much of the surrounding land as is necessary to their fair enjoyment. In the present case, however, the supreme court held that a different rule should obtain, the measure of exemption depending upon whether the property involved is actually devoted to public use. The testimony indicated that the purchase of a tract considerably larger than was actually needed for the filtering beds was necessitated to avoid a nuisance to adjoining property owners. Sustaining such a purchase as a public use the court said: "It seems to us that the municipalities were bound to purchase a tract of land of sufficient dimensions to prevent the intended use from becoming a nuisance, and that this element should be considered in determining whether the property is held for a public use."

Water Shortage Ties Up Harrisburg.

Harrisburg, Pa.—Following a series of mishaps and greatly increased consumption due to weather conditions, the city faced an acute water famine which resulted in the shutting down all industry for a period of six days. The situation, however, is not expected to be normal until February 15, by which time repairs will have been completed to the pump, the breaking of which caused the difficulty, and the new electrically-operated 500,000-gallon pump will be in operation. J. W. Ledoux, of Philadelphia, consulting engineer, was retained by city commissioner Hassler to make an investigation and report on the situation. With the closing of all industrial and manufacturing plants, except public utilities, bakeries, hospitals and milk depots, thousands of employees were thrown out of work. A committee was appointed by mayor Keister, consisting of representatives of the leading industries, with full power to take whatever action it deemed necessary in the crisis. Water was pumped from the supplies of Dauphn, Hummelstown and Steelton. A proclamation was issued by the mayor calling for care in water use by all consumers. Health officer Raunick urged all to boil the water used for domestic purposes. A survey showed that the average water consumption per capita is 151 gallons each day. This figure includes water supplied for all purposes, including commercial, domestic, public uses and allowance for loss. In Harrisburg, the domestic uses require seventy-eight gallons. Domestic consumption totals 575,000 gallons each day; industries, 560,000. Citizen consumers pay 10 cents a thousand gallons; industries pay from 3½ to 8 cents a thousand. For a year—that of 1917, for example—citizens paid $95,376.66 for their water service; industries paid $70,806.70. Every citizen pays the regular rate of 8 cents a thousand gallons for water; eighty-five per cent of the industries pay but 3.25 cents a thousand. Total number of gallons pumped during November was 341,060,200. Of this amount the 13,500 metered and unmetered houses consumed 173,416,700 gallons; the industries, 167,643,500.

Company Supplies Unfiltered Water Despite State Board.

Montclair, N. J.—Characterizing the action as the "biggest piece of effrontery ever perpetrated on the town," mayor Louis F. Dodd has determined to obtain redress for the action of the Montclair Water company in breaking a seal placed by the state board of health to prevent the supplying of unfiltered water to the town. Two weeks before the town officials discovered that a large proportion of unfiltered water, which was only treated, was being sent from the Passaic river into the towns' mains. This was found to be the case in Bloomfield, Nutley and other communities served by the East Jersey Water company. An unusually large number of cases of intestinal disorder were reported, reaching over 1,500 now. It was found that by an order from Mr. McAdoo at Washington, issued on the request of Jersey City manufacturers to the President's secretary, Joseph Tumulty, the water company had sent a large part of its supply to that city. The strain on the filtration system was so great that about one-ninth of Montclair's supply had to come from the Passaic river, treated, but unfiltered. On being notified of the situation by secretary A. Prescott Folwell, of the Montclair health board, the state board of health sent a number of investigators to the town. The Washington order was "disavowed" by secretary McAdoo. The state health board placed a seal at the valve at the Little Falls filter plant and the town asked the company not to change the water supply again without official notification. The town commission was surprised at a notice from the health officer, Chester H. Wells, that the state seal had been broken and river water was again being supplied. The health board warned all citizens to continue boiling their water and boiled water was furnished to the pupils of the schools.

Instal New Air-Lift System.

Kaukauna, Wis.—Supt. W. B. Montgomery, of the water department, is being congratulated on his solution of the city's water problem which has vexed the city for a long time. The diminished and unreliable flow of water from the artesian wells has proved annoying and a potential source of danger in an emergency. After investigation of the situation in other cities, supt. Montgomery last October ordered equipment for the installation of an air-lift system. The work is now completed, having been delayed by freight conditions. The total cost of the installation is only $1,800 and the equipment is guaranteed to deliver 500 gallons per minute, or about 700,000 per day, about three times the amount of the present water consumption. Previously to the improvement, the three wells could deliver not more than 235 to 250 gallons. The system is operated by a 24 h. p. motor, and the cost is very low. Before the installation it was never possible to maintain enough water in the reservoirs at all times necessary for fire and consumers' needs. Now the reservoirs will be filled with the necessary 300,000 gallons. The need of new wells has also been obviated. The quality of the water is said to be improved by the incidental aeration.

STREET LIGHTING AND POWER

Dissolve Injunction Against City Reducing Rates.

Amarillo, Tex.—Federal judge W. R. Smith has dissolved the temporary injunction of the local light company against the city, restraining the municipality from decreasing the rates on domestic and power current. The rates now enjoyed by the city are said to be the lowest in the state. The case comes up in federal court this month for permanent settlement.

U. S. Asks Gas Standard Reduction in New Jersey.

Trenton, N. J.—In a response to a request from the War Department, the state public utilities commission has made an order, effective at once, permitting a thirty-day reduction in the standard of gas supplied by the Public Service Gas company from its plants in Newark, Jersey City, Paterson, Trenton and Camden. The present average standard of 600 British thermal units now required is reduced under the order to 570 B. t. u., with a stipulation that the minimum shall not fall below 550. The order was made subject to the proviso that all toluol, a byproduct obtained in the manufacture of gas and used in the production of high explosives, should be furnished to the United States government. The government is threatened with a scarcity of toluol in its munition plants. Lowering of the gas standard will increase the available supply of toluol. The decision of the board was reached at a hearing resulting from a telegraphic request received by the commission from lieutenant-colonel Burns of the ordnance department. He informed the commission that, because of existing confusion in railroad facilities and the commandeering of oil tank steamers for the navy use, there has been a shortage in the oil supply available for gas companies. This forced the Public Service Gas company to suspend the operation of its toluol plant. Vice-president Whitcomb of the company said there is practically no profits derived from the manufacture of toluol. In answer to a question from president Donges, of the commission, he said the product is manufactured at a cost of seventy cents a gallon, not including overhead charges, and is sold for $1.50 a gallon. The proposed reduction of thirty British thermal units in the gas standard, Mr. Whitcomb said, would not make a difference of one-half cent in the manufacture of 1,000 cubic feet of gas. He asserted the reduction would not be noticed either by domestic or commercial consumers. Claude H. Anderson, secretary of the League of New Jersey Municipalities, informed the commission of resolutions adopted by the league, favoring the granting of the request made by the War Department. He suggested, however, that in the event of a request for an extension, the league be notified.

Allow Gas Rate Increases.

Charleston, W. Va.—Increases in gas rates amounting to approximately 12 to 20 per cent were allowed by the West Virginia public service commission when president E. R. Morgan, of the commission, made public his opinion based on the application of the West Virginia Central Gas company, the West Virginia and Maryland Gas company and the Northern Natural Gas company, which supply numerous towns in central West Virginia with natural gas. The three companies asked for increases amounting to 25 or 30 per cent, but the order reduced the rates asked. The towns and vicinity listed in the order are: Jane Lew, Butcherville, Deanville, Lightburn, Buckhannon, Berlin, Hodges, Philippi, Volga, Hall, Bellington, Junior, Dartmour, Elkins, Beverly, Mill Creek, Huttonsville, Parsons, Hambleton, Hendricks, Montrose, Moore, Davis, Thomas, Douglas, William, Bayard, Dobbin, Gormania, Henry, Elk Garden, Piedmont, Keyser, Terra Alta, Corinth, Ridgely, Albright, Rowlesburg, Manheim, Kingwood, Tunnelton, St. George and Black Fork. The new rates are effective as of January 1 in the order. The case has been pending for some time, and a thorough investigation was made by H. E. Nease, the commission's expert statistician.

FIRE AND POLICE

New Wage Scale for Police and Firemen.

Scranton, Pa.—Police and firemen have been granted salary increases by council, but the increases are much less than the expected $150 as provided by the Burke act. The men of the two bureaus are still dissatisfied over action on the Burke act, and are talking of going into court for a decision as to the constitutionality of the act. Council revised the police salaries on the basis of making $100 the maximum for a patrolman. The old scale was as follows: First and second year, $70; third year, $75; fourth year, $80; fifth year, $85, and after five years, $90. The new scale gives the first year patrolman, $75; second year, $80; third year, $85; fourth year, $90; fifth year, $95, and after five years, $100. Council has also provided that all men in the fifth year class will be advanced from $95 to $100 beginning July 1 next. The new scale for firemen provides for $70 for the first year; $75 for second year; $80 for third year; $85 for fourth year; $90 for fifth year and thereafter $90. This is an increase of $5 a month for all men except the five year men who get a $10 increase.

Woman Deputy Police Chief for New York.

New York, N. Y.—Police commissioner Richard E. Enright has appointed Mrs. Ellen A. O'Grady to the position of fifth deputy police commissioner. Mrs. O'Grady has been a resident of Brooklyn for twenty-five years and a civil service probation officer in the courts of Brooklyn for the last ten years. Her time will practically be devoted to the investigation and elimination of the white slave traffic, also looking after loafers on street corners, subway and elevated trains, who make it their business to insult and annoy women and girls. Mrs. O'Grady received $1,340 in her position as probation officer and will receive $6,000 a year as deputy commissioner. Enright was recently appointed after mayor Hylan had requested and received the resignation of Frederick H. Bugher, the mayor's first appointee as police commissioner. The affair was marked by a somewhat sensational interchange of letters. Bugher charged the mayor with attempting political domination of the department, while the mayor denied this, and countercharged that there were sinister influences protecting certain members of the motor-cycle squad from prosecution in connection with graft charges arising out of the notorious Ruth Cruger case. The mayor also said that Bugher had refused to appoint a woman police commissioner at his request. The situation is generally attributed to the desire of Tammany to get a stronger hold on the department. The new commissioner was for ten years head of the police lieutenants' benevolent organization, and was so intrenched in political power as to be feared by commissioners, and therefore skipped a number of times in promotions. Commissioner Enright has declared for a "tight lid." He has added greatly to his popularity in the department by abolishing the "shoo-fly" system, which was established when Theodore Roosevelt was president of the board of police commissioners twenty-three years ago, and has been in existence ever since. The "shoo-flies" are policemen of various ranks in plain clothes, who have been sent out directly from police headquarters to make reports on the conditions in different precincts and to notify the commissioner whenever they found patrolmen, sergeants, lieutenants, captains or inspectors at fault. Since the war the "shoo-flies" have been largely renamed "the submarines." For the "shoo-fly" system commissioner Enright announced that he has substituted the honor system. The men who have been assigned to inspect conditions and call the attention of police headquarters to derelictions of policemen and police officers of every grade have been placed on duty in various precincts. Commissioner Enright explained that he expected to maintain the police department at the highest pitch of efficiency by putting the policeman on his honor to patrol his beat faithfully and by holding every officer, from inspector to sergeant, strictly responsible for the work of all men under his command.

Police Salaries Increased at Request of Taxpayers.

Asheville, N. C.—Police salary increases ranging from $2.50 to $12.50 a month were ordered by the city commissioners after listening to the arguments of a room full of business men asking that their taxes be increased that the officers might be paid a living wage. The increases will be effective at once. The following increases were granted: Chief of detectives, from $87.50 to $100; captains of police, from $87.50 to $90; clerk of police court, from $92.50 to $95. Detectives in the service over one year were raised from $82.50 to $87.50. The pay of those in service less than one year to be determined by the director of safety, but not to exceed $87.50, patrolmen in service over one year were increased from $75 to $85, the wages of those in service less than one year to be determined by the commission of safety, but not to exceed $85.

Charge Firemen's Deaths to Politics.

Philadelphia, Pa.—Three firemen were killed and thirteen others seriously injured by a falling wall when fire destroyed a public school here. The dead are: Lieutenant Harry Worth, captain James Stewart and ladderman James Pollock. The firemen were caught on top of the falling wall as they were directing the men in a vain effort to save the structure. The loss is estimated at $200,000. This school is the second public school to be destroyed by flames last month. The other school is less than a half mile away. Both fires are in the section of West Philadelphia that for the past ten weeks has been terrorized by incendiaries, automobile bandits and second-story men. The grand jury has presented to judge Baldridge a report, in which it charges that the death of the firemen is due indirectly to politics. It says: "We note the frequency of fires lately and cannot escape the belief that they are of an incendiary origin. The prevention of such fires is a subject that should cause the greatest vigilance on the part of the authorities, and the apprehension of the incendiaries should be more certain and frequent. This object can only be obtained by an efficient and adequate police force. For the personnel of the present force we have nothing but praise. They appear to us to be a clean-cut, up-standing and courageous body of men, and if they were removed from the pernicious influence of party politics their independence and efficiency would be greatly enhanced. We therefore recommend an absolute divorce of the police from politics. While on the subject of fires we consider it our duty to consider the department in charge of that branch of the city's service, and the personnel of the members of that department. We find that the same pernicious influence of politics pervades the fire department as it does that of the police, and for its greater efficiency the same recommendations of divorce from politics applies as in the case of the police. Inefficiency in that department has been shown in recent conflagrations, where officers in command, had they been well trained in their work, might have saved the lives of the men under them. But it appears to us that men are placed in command, not because of their knowledge of the best means of fighting fires, but because of their ability to fight for the brand of politics or leaders that placed them in position."

Difficult Fire in Rendering Plant.

Syracuse, N. Y.—Fire of unknown origin did damage estimated at $100,000 to the plant of the Syracuse Rendering Company, on the towpath of the Erie Canal, a short distance east of this city. The blaze was discovered on the top floor or the four-story wooden tank house, and is believed to have originated in the drying room. Persons in the neighborhood saw flames shooting from windows in the building, and running to the engine room, where the engineer was at work, gave the alarm. The flames began to spread through the tank house with great rapidity, feeding on the fats and oils in the building. A telephone alarm was sent to the Syracuse fire department, and engine company No. 7 responded, district chief Gieselman in charge. It took the company nearly half an hour to reach the place, and then it was found water could not be drawn from the canal. A 500-gallon pump was used for a time, but it gave out in about two hours. By its use five small streams had been played on the buildings. The tank house was doomed, and efforts were directed principally toward saving the other structures. The storehouse could not be saved. Hose was run from another factory, about 1,500 feet, to the rendering plant; and after the pump gave out that was all the water available to fight the fire. The hose crossed the main line tracks of the New York Central Railroad and held up all trains. Railroad men, it was said, threatened to cut the hose, and after two hours the hose was broken. Five lengths became frozen and had to be replaced. The flames were so intense that the firemen were unable to get close to the tank house, and they divided the stream from the single line of hose between two other buildings. Early during the fire, heating pipes, running from the tank house to the office building, enclosed in a wooden box about fifty feet in the air, broke and fell across telephone and electric light cables, carrying them to the ground. The roof of the tank house fell and a wall gave way, two large tanks rolling out and almost catching two firemen under them. An ether tank in the building then exploded, spreading its fumes and driving back the fire-fighters.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

City Revenues—Application.

(Nev.) The revenues of a city raised by taxation, though levied for specific public purposes, may be applied by the Legislature to other municipal uses subject to constitutional limitations.—City of Reno v. Stoddard, 167 P. 317.

Paving of Street—Continuity.

(Or.) The paving of a street, whose continuity was interrupted by a small park, does not constitute two improvements, so as to require their separation under Portland City Charter, § 374, as to public improvements.—Lawrence v. City of Portland, 167 P. 587.

Power to Select Pavement—Delegation.

(Or.) The power of a city council to "determine the character, kind, and extent of improvements" to be made cannot be delegated to the city engineer.—Lawrence v. City of Portland, 167 P. 587.

City Officers—Services to City.

(Iowa.) Under Code Supp. 1913, § 879q, prohibiting municipal officers from being interested directly or indirectly in any services to be performed or material furnished for city, and making violation a misdemeanor, city officer who renders service to city though in good faith, is not entitled to compensation therefor.—Peet v. Leinbaugh, 164 N. W. 127.

Street Paving Maintenance for Five Years.

(Or.) The requirement in a contract for paving a street that the contractor shall make good any defects in materials or workmanship occurring within five years does not so increase the burden or the cost of the improvement as to vitiate the assessments therefor.—Lawrence v. City of Portland, 167 P. 587.

Determining Benefits—Basis.

(Wash.) In determining benefits to property from opening of streets, present use cannot be made basis of determining benefits which may accrue.—In re West Wheeler St. under Ordinance No. 23041, 167 P. 41.

GOVERNMENT AND FINANCE

New City Managers.

Madill, Okla.—H. L. McDuffie has been appointed new city manager of this city. He succeeds J. K. Ross.

Denton, Tex.—Sam C. Gary, city manager, has been replaced by P. J. Beyette.

Mayor Demoted by Other Commissioners.

Long Branch, N. J.—Mayor Marshall Woolley, Democrat, who was elected to the office in May, 1916, has been deposed and John W. Flock, Republican, elected in his place. The resolution naming Flock declared: "It is necessary for the efficient and economical conduct of the business of the city that a redesignation of the commissioners take place." Mayor Woolley refused to put the resolution and resigned the chair under protest, declaring that he would institute quo warranto proceedings. The deposed mayor was assigned to the department of parks and public property in the resolution. Mr. Howland was put at the head of the department of revenue and finances; Isaac Woolley, the newly elected commissioner, at the head of the streets, and Dr. James Chasey, head of the department of public safety. Mr. Woolley is the first mayor under commission rule in New Jersey to be deposed.

Boulder Appoints a City Manager.

Boulder, Colo.—The chief of police of Alameda, Cal., Edward Oscar Heinrich, has been appointed city manager and commissioner of public safety of this city. Heinrich stood at the head of a list of 110 applicants for the position. The new city manager was formerly a lecturer on criminology at the University of California. He will receive $5,000 a year in his new position, which he enters February 15.

Otis Goes from Beaufort to Auburn, Me.

Auburn, Me.—H. G. Otis, city manager of Beaufort, S. C., has left that position to assume a similar one in Auburn under the commission-manager charter, adopted here last September. Otis is secretary and treasurer of the City Managers' Association, and is widely known in his profession. He has successfully served as manager of Beaufort for two years. He trained for the new profession in the city managers' course in the graduate school of the University of Michigan and in the Training School for Public Service of the New York Bureau of Municipal Research. The salary of his new position is $3,600.

Abolishing Position—Discharging Employe.

(Mass.) The commissioner of public works has a right to abolish an unnecessary position, but cannot use that right to conceal discharge of an employe in violation of civil service law.—Murphy v. Justices of Municipal Court of Dorchester Dist. of City of Boston, 116 N. E. 969.

Abolishing Office—Reasons.

(N. J. Sup.) A municipal office may be abolished for economical or beneficial reasons, and the incumbent deprived of his office, although protected by a tenure of office statute.—Cahill v. Town of West Hoboken, 101 A. 417.

Action for Price of Supplies—Sum in Treasury.

(Ga. App.) A municipality may defeat an action for price of supplies necessary to operation of its light and water plant by showing that at time liability was incurred there was not a sufficient sum in treasury to discharge same, and that a sufficient sum could not have been raised by taxation during current year.—Town of Whigham v. Gulf Refining Co., 93 S. E. 238.

Payments to Contractor—Interest on Deferred Payments.

(N. Y. Sup.) Contractor on public improvement under contract providing for payments in monthly installments, if entitled to interest on deferred partial payments, is entitled to interest only from 30 days after date of demand on city comptroller.—Ryan v. City of New York, 166 N. Y. S. 575.

Police Power—Manufacture, Use and Sale of Drugs.

(N. Y. Sup.) Whether ordinance regulating manufacture, distribution, and use of medicines and drugs, purporting to have been adopted in exercise of police power, is calculated and appropriate to accomplish its end, is open to judicial scrutiny.—E. Fougera & Co. v. City of New York, 166 N. Y. S. 248.

Grant of Power to Water Board—Legality.

(Md.) Grant of power to water board to make rule as to introduction of water into premises, made by Baltimore City Code 1906, art. 40, providing that water board shall have power to make all rules for laying and tapping of pipes, etc., was not unlawful delegation of power to water board.—Lee v. Leitch, 101 A. 716.

Removing Officers—Modes of Procedure.

(Cal. App.) Where, in acts of Legislature, and in provisions of municipal charters, there are set down modes of procedure for removal of municipal officers which are inconsistent, charters will control.—Betkouski v. Superior Court in and for Los Angeles County, 166 P. 1027.

Corporation Counsel—Power to Bind City.

(Wash.) The corporation counsel of a city, representing it at the trial of a suit to cancel special assessments, has power to bind the city by a stipulation as to the payment of damages and waiver of assessment.—Richardson v. City of Seattle, 166 P. 639.

Police Power—Power to Refuse Permit to Finish Building.

(Minn.) Under ordinance prohibiting erection of factory in residential district, building inspector could not refuse permit to finish uncompleted flat building conforming to building ordinances which might be used for some proper purpose, though plans had adapted it for factory.—Meyers v. Houghton, 163 N. W. 754.

Private Detectives as Patrolmen—Municipal Ordinance.

(Cal. App.) In so far as St. 1915, p. 1253, provides that private detectives holding licenses from state board of prison directors may act as uniformed patrolmen within city of Oakland, but without complying with ordinances regulating such service, such provisions must yield to ordinance of city regulating granting of permits to conduct patrol service; it being a municipal affair, within Const. art. 11, § 6.—Ex parte Hitchcock, 166 P. 849.

Special Assessments—Benefit.

(Ark.) Special assessments to pay cost of local improvement are levied on property itself, not against owner as personal liability, and benefit must be to property itself to justify taxation.—Snetzer v. Gregg. 196 S. W. 925.

Assessments—Rule for Benefits.

(Pa.) Where property adjoins the improvement and becomes subject to assessment for benefits, the rule in estimating damages and benefits is the difference in the market value as a whole before and after the improvement.—City of Philadelphia v. Conway, 101 A. 472.

Liability for Defective Highways.

(Me.) Independent of statute, there is no liability on the part of municipalities for injuries caused by defective highways.—McCarthy v. Inhabitants of Town of Leeds, 101 A. 448.

Errors in Assessing—Correcting.

(Tex. Civ. App.) Under Ft. Worth Charter, c. 14, § 13, providing that errors in levying assessments may be corrected by reassessment, the city has right to reassess property to correct errors of description or in name of owner.—Texas Bitulithic Co. v. Henry, 197 S. W. 221.

Change of Use of Building—Permit.

(N. Y. Sup.) The owner of a private residence cannot change its occupancy or use to that of a sanitarium, after the adoption of Building Code, § 70, subd. 2, and section 72, subd. "a," until plans are filed, and building altered, and certificate of approval issued.—People ex rel. Ruccione v. Miller, 166 N. Y. S. 370.

Tax Bill Validity.

(Mo. App.) Tax bill rendered to property owner for sewer assessments was not void because it included more land than he owned at time, where it was easy to determine correct amount of tax on his property.—City of Washington ex rel, Buel v. Stumpe, 197 S. W. 165.

Road Location—Weight of Established Route.

(Iowa.) Practical construction for 50 years of the location of a highway established by order should be given great weight, where otherwise its proper location would be in great doubt, if not insolvable uncertainty.—Merrill v. Hutchins, 164 N. W. 184.

Guard Rails—Negligence.

(Ohio.) After county commissioners have erected guard rails, as required by Gen. Code, § 7563, the county is not liable thereunder for negligence in erection of guard rails on other parts of an approach or an embankment.—Board of County Com'rs of Franklin County v. Darst, 117 N. E. 166.

Local Improvement Districts—Boundaries.

(Ark.) County and other municipal lines are not concerned in forming local improvement districts, since there is no express limitation in the Constitution upon the creation of such districts except those wholly within cities and towns.—Bennett v. Johnson, 197 S. W. 1148.

Use of Land for Highway—Prescriptive Right.

(Ill.) Under our statute (Hurd's Rev. St. 1915-16, c. 121, § 139) the continued and uninterrupted use of land as highway for statutory period will be presumed to have been under claim of right, and creates a prescriptive right, without further proof of acts or recognition on part of authorities.—Phillips v. Leininger, 117 N. E. 497.

Road Tax—Levy—Right to Tax.

(Ill.) Though hard road tax for number of years is separate and distinct tax for each year, Laws 1913, p. 520, makes it duty of commissioner of highways to levy tax for whole period, but failure to make such levy at beginning of period does not destroy right to tax for remaining years of period fixed by election.—Reynolds v. Town of Elkhorn Grove, 117 N. E. 457.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Asphalt.

Stone-Filled Sheet Asphalt Suffers from Inattention to Detail. Uniformity of composition must be maintained and sufficient surface energy from fine aggregate provided. A maximum thickness of one and a half inches on a close binder is best practice. By Clifford Richardson. 2,000 words. Engineering News-Record. Jan. 17. 15 cts.

Methods and Cost of Constructing Kentucky Rock Asphalt Road. By William S. Canning. 5 ills., 1,600 words. Engineering & Contracting. Jan. 2. 10 cts.

Bituminous.

Efficiency of the Application of Bituminous Materials for Surface Treatments on Gravel and Broken Stone Roads. From a paper by Julius Adler. 2,800 words. The Canadian Engineer. Jan. 24. 15 cts.

Condition of Road Surface Outweighs Type of Bitumen. Other details secondary in importance. Surface tension suggested as a measure of value. Alternate freezing and thawing worst enemy. From a paper by Julius Adler. 2,200 words. Engineering News-Record. Jan. 10. 15 cts.

Brick.

Notes on Brick Paving. Outfits and methods used in constructing monolithic and sand cushion pavements. Applying asphalt filler to close joints. 2 ills., 2,000 words. Municipal Journal. Jan. 5. 10 cts.

Rattler Test Called Unfair for Paving Brick. Experience indicates need of allowance to correct losses on samples of varying depths to common basis. Large spheres too severe. From a paper by W. C. Perkins. 1,600 words. Engineering News-Record. Jan. 10. 15 cts.

Tests Show Superior Strength of Monolithic Brick Pavements. 5 ills., 1,000 words. Dependable Highways. December. 10 cts.

Construction Plant and Methods Employed in Building Monolithic Brick Road near Indianapolis. By M. B. Greenough. 6 ills., 800 words. Municipal Engineering. January. 25 cts.

Concrete.

The Designing of Concrete Pavements. Discussed in the light of most recent experiences and investigations. Importance of drainage still not appreciated. Selection of materials; cement, fine and coarse aggregate; reinforcement; jointing materials. By C. C. Brown. 3 ills., 2,000 words. Municipal Journal. Jan. 5. 10 cts.

The Designing of Concrete Pavements. Recent experiences and investigations. Broken stone and gravel; reinforcement; jointing materials; laying in one or two courses; thickness; finishing; shoulders and ditches. By Charles Carroll Brown. 2 ills., 2,500 words. Municipal Journal. Jan. 12. 10 cts.

Reducing Concrete Mixer Gang. Aggregate loaded into motor truck with body partitioned to hold batches. 800 words. Municipal Journal. Jan. 26. 10 cts.

Should a Concrete Road Be Thicker at the Center than at the Sides? Three letters discussing the subject. 1,100 words. Engineering & Contracting. Jan. 2. 10 cts.

Cracks in Concrete Pavements. Data from U. S. Office of Public Roads. 700 words. Canadian Engineer. Jan. 3. 15 cts.

Design and Construction of Concrete Roads in Wood County, W. Va. By Burdette Woodyard. 2 ills., 1,000 words. Municipal Engineering. January. 25 cts.

Reinforcement for Concrete Pavements. 3 ills., 1,500 words. Municipal Engineering. January. 25 cts.

Convicts.

Prison Labor in New Jersey. Military road built at considerable saving in cost. By L. C. O'Connor. 600 words. Good Roads. Jan. 5. 10 cts.

More Convicts for Arkansas Roads. 300 words. Good Roads. Jan. 19. 10 cts.

Design.

Recent Developments in the Design and Construction of Road Surfaces. Discusses waterbound and bituminous macadams, concrete and monolithic brick. Foundations. 3,000 words. Engineering & Contracting. Jan. 2. 10 cts.

Principles of Design, Construction, Maintenance and Financing of Roads and Pavements. From a paper by J. W. Howard. 1,000 words. Municipal Engineering. January. 25 cts.

Recent Developments in the Design and Construction of Road Surfaces. By H. E. Breed. Canadian Engineer. Jan. 17 and 24. 15 cts. each.

The 1918 Highway Program Should be Considered from a National Standpoint. All construction and maintenance should be dealt with in a selective manner. All uncompleted links in main systems should be completed first. By L. W. Page. 1,500 words. Engineering News-Record. Jan. 31. 15 cts.

Federal Aid.

Will Determine What Roads Should Receive Federal Aid. Office of Public Roads sends questionnaire to all State Highway Departments. Only vitally necessary road work to be encouraged. 700 words. Engineering News-Record. Jan. 24. 15 cts.

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Granite Block.

The Present Status of Granite Block Pavements. Development of this type and present practice in construction. From a paper by C. D. Pollock. 2,400 words. Good Roads. Jan. 5. 10 cts.

Modern Granite Block Pavements. Most satisfactory materials for fillers and methods of mixing and applying same. Sand and sand-cement cushions. Shallow blocks. From a paper by Clarence Pollock. 750 words. Municipal Journal. Jan. 5. 10 cts.

Macadam.

Asphaltic Macadam Road Building in the Michigan Copper Range. By C. C. Lakin. 6 ills., 1,100 words. Municipal Engineering. January. 25 cts.

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The Construction and Maintenance of Highways Under War Conditions. From a paper by A. H. Blanchard. 2,000 words. Engineering & Contracting. Jan. 2. 10 cts.

Maintenance of Earth Roads. Methods in Minnesota. 1,000 words. Engineering & Contracting Jan. 2. 10 cts.

Methods of Maine State Highway Department for Maintenance of Gravel Roads. Details of road drag. 1 ill., 1,800 words. Engineering & Contracting. Jan. 2. 10 cts.

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Military Roads.

Military Roads. From a paper by W. D. Sohier. 12,000 words. Better Roads & Streets. January. 15 cts.

Military Roads. From an address by Col W. D. Sohier. 7,500 words. Engineering & Contracting. Jan. 2. 10 cts.

Miscellaneous.

What Road Improvement Has Done for the Yuma Valley in Arizona. A striking example of the benefits accruing to the community through the improvement of its highways. 5 ills., 1,000 words. Good Roads. Jan. 19. 10 cts.

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Sidewalk Construction at Intersections. 1 ill., 150 words. Municipal Journal. Jan. 5. 10 cts.

State Work.

The Proposed Illinois State Highway System a Notable Advance in the Financing of Highway Construction. 1,100 words. Engineering & Contracting. Jan. 2. 10 cts.

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Methods and Materials for Paving Between Street Railway Tracks. The seventh in a series of articles This one describes the practice in Toronto. By M. A. Stewart. 6 ills., 2,600 words. The American City. January. 50 cts.

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Lessons Learned from Road-Work in War Years Will be Permanently Helpful. Freight Bureau effects many economies and shortens delays. Construction and maintenance departments co-operate. Commission takes over much work. By H. E. Breed. 2,500 words. Engineering News-Record. Jan. 31. 15 cts.

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Problems and General Methods of Erecting the Sciotoville Bridge The first of three articles on original plan employed, with elimination of secondary stresses in placing large two-span continuous structure of C. & O. By C. B. Pyle. 17 ills., 4,000 words. Engineering News-Record. Jan 10 15 cts.

Truss Erection and Jacking Operations for Two 775-foot Continuous Spans. Section of three articles on Sciotoville bridge erection. By C. B. Pyle. 8 ills., 5,000 words. Engineering News-Record. Jan. 31 15 cts.

Decision of U. S. District Court of Iowa on Certain Luten Patents for Concrete Bridges 3,500 words. Engineering & Contracting. Jan. 23. 10 cts.

Turning Back Abutment Wing Walls Saves Material. Revising layout of straight wall abutments also improves appearance, particularly in skew bridge. By C K. Mohler. 3 ills., 2,500 words. Engineering News-Record. Jan. 24. 15 cts.

STRUCTURES AND MATERIALS.

Spalling of Reinforced Concrete in Moist Location. Surface destruction in upper part of measuring tank. Concrete good quality. Was 1:2:4 mix, 12 years old. By F. E. Turneaure. 2 ills., 1,000 words. Engineering News-Record. Jan. 3. 15 cts.

Eight-inch Hardwood Rollers Take 12 to 18 Tons per Foot. Results of tests on maple, sycamore and oak rollers. By A. B. McDaniel. 2 ills., 1,300 words. Engineering News-Record. Jan. 17. 15 cts.

MISCELLANEOUS.

Police in Pennsylvania Boroughs. Cost of police service. 500 words. Municipal Journal. Jan. 12. 10 cts.

Municipal Work and the War. Opinions of mayors in different parts of the country as to the extent to which municipal public work should be continued next year. 3,000 words. Municipal Journal. Jan. 5. 10 cts.

Municipal Engineering and the War. Experiences of English cities at the beginning of the war. Road wear intensified. Sewerage and water supply. From an address by H. Percy Bulnois. 1,500 words. Municipal Journal. Jan. 5. 10 cts.

City Survey Monuments. A review of the practice of several Canadian cities. Permanent city survey monuments are desirable. Some details as to cost. By H. L Seymour. 5 ills., 4,000 words. Canadian Engineer. Jan. 3. 15 cts.

U. S. Reclamation Service Specifications for Electrically Operated Dragline Excavators. 5 ills., 3,000 words. Jan. 16. 10 cts.

Method of Clearing Cut-Over Land with Fire. From a bulletin by C. H. Shattuck. 2 ills., 1,500 words. Engineering & Contracting. Jan. 16. 10 cts.

Method and Cost of Clearing Cut-Over Land with Powder. Amount of powder used for each size of stump. 3,600 words. Canadian Engineer. Jan. 10. 15 cts.

Shaft and Tunnel Ventilation by Canvas Tubing. From a paper by L. D. Frink. 1 ill., 2,500 words. Engineering & Contracting. Jan. 16. 10 cts.

Driving Concrete Piles by Well Drilling Method. By J. L. Harrison. 1 ill., 1,000 words. Jan. 16. 10 cts.

Practical Measures for Securing Greatest Economy in Public Utility Plant Operation. By Chas. Brossman. 4,000 words. Municipal Engineering. January. 25 cts.

Drill Bits and Drill Steel. Machine factors—size, depth and angle of holes; proper type of drill bits to use; angle of cutting edge; shape of the cutting edge; length and area of the reaming edge; new types of double arc bit. 15 ills., 4,200 words. Engineering & Contracting. Jan. 16. 10 cts.

St. Paul Committee Proposes Minimum Fees for Engineers. Sliding scale proposed with additional charges for time beyond contract period. 900 words. Engineering News-Record. Jan. 24. 15 cts.

Portable Units Form Buildings for Labor Camps. Sectional bunk-houses more convenient and sanitary than boxcars or shacks. Cost 7½ cents per cubic foot. 3 ills., 1,000 words. Engineering News-Record. Jan. 17. 15 cts.

PERSONALS

Dappert, J. W., city engineer, Taylorville, Ill., has the distinction of serving his country by having four sons in the U. S. Army.

Fitzpatrick, Otto F., has been appointed city engineer of Crawfordsville, Ind. He has served seven years as assistant city engineer.

Pierce, Daniel T., who has been for several years executive assistant of the General Asphalt Company, Philadelphia, Pa., and who recently organized the Information Department of the American International Shipbuilding Corporation, has sailed for France on a special mission for the Red Cross.

Smith, Culla. J., new mayor of Hamilton, O., has appointed the following: F. J. J. Sloat, service director; Henry B. Grevey, safety director, and George W. Kindred, street commissioner.

The following are new officials:

Brockton, Mass.—Water commissioner, Horace Kingman; city engineer, Harold S. Crocker; city physician, Willian D. Ducy; city marshal, Daniel M. Ryan, Jr.; board of health, Dr. Fred J Ripley; highway commissioner, James F. Powers.

Gardiner, Me.—Street commissioner, Costello B. Welsh; chief of police, Walter K. Wakefield; city engineer, Leonard M. Barnard.

Scranton, Pa.—Director of public works, Robert W. Allen; director of public safety, Arthur G. Davis; director of public health, Dr. S. P. Longstreet.

Butler, Pa.—Superintendent department public affairs (including police and fire departments), Mayor Joseph A. Heineman; superintendent department accounts and finances, councilman Ira McJunkin; superintendent department public safety (including health and garbage), councilman James Green; superintendent department streets and public improvements, councilman Andrew Christiansen; superintendent department parks and public property, councilman Carl H. Barnard; city clerk, Frank H. Murphy; city engineer, H. O. Carson.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

Feb. 7-9.—AMERICAN CONCRETE INSTITUTE. Annual convention, La Salle Hotel, Chicago, Ill. Secretary, H. B. Alvord, 27 School street, Boston, Mass.

Feb. 8-9.—AMERICAN CONCRETE PIPE ASSOCIATION. Annual convention, Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. LaSalle street, Chicago.

Feb. 15.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, State House, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 20.—CAROLINA ASSOCIATION OF HIGHWAY ENGINEERS. First meeting, Chapel Hill, N. C. Secretary, N. S. Mullican, county highway engineer, Lexington, N. C.

Feb. 21, 22.—NORTH DAKOTA SOCIETY OF ENGINEERS. Tenth annual convention, Fargo, N. D. President, J. A. Ingram, Grand Forks.

Feb. 21-23.—NATIONAL SOCIETY FOR THE PROMOTION OF INDUSTRIAL EDUCATION. Eleventh annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa. Ass't secretary, May Allison, 140 West 42d street, New York, N. Y.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Institute of Electrical Engineers.

The sixth annual midwinter convention of the American Institute of Electrical Engineers will be held February 15 and 16 in the Engineering Societies' Building, New York.

On account of war conditions the meetings and papers committee, with the approval of the board of directors, has decided to make this convention purely a business meeting, and therefore no entertainment features or excursions have been included in the program.

The convention will include four technical sessions, which will take place on Friday morning, Friday afternoon, Friday evening and Saturday morning. A strictly informal dinner will be held between the afternoon and evening sessions on Friday.

The session on Friday morning will be devoted to the subject of Circuit Breaker Ratings; that on Friday afternoon to Meters and Measurements. The Friday evening session will be devoted to a lecture by Dr. A. C. Crehore on "Some Applications of Electromagnetic Theory to Matter," followed by discussion. This session will be of general interest to every one, as the subject will be presented in a popular and non-technical manner. The session on Saturday morning will be devoted to the subject of "Alternating Current Commutator Motors."

The regular monthly meeting of the board of directors will be held Thursday evening at 8 p. m. at Institute headquarters.

The papers to be presented are as follows: "Rating and Selection of Oil Circuit Breakers," by E. M. Hewlett, J. M. Mahoney and G. A. Burnham, on Friday morning .

The session on meters and measurements will be devoted to: "A New Standard for Current and Potential," by C. T. Alcutt; "The Thermoelectric Standard Cell," by C. A. Hoxie; "The Character of the Thermal Storage Demand Meter," by P. M. Lincoln; "Measurement of Power Losses in Dielectrics of Three-Conductor, High-Tension Cables," by F. M. Farmer.

The papers presented at the Saturday afternoon session will be: "Commutation in Alternating-Current Machinery," by Marius A. C. Latour; "The Secomor—a Kinematic Device Which Imitates the Performance of a Series-Wound Commutating Motor," by V. Karapetoff; "The Polyphase Shunt Motor," by W. C. K. Altes.

Illuminating Engineering Society.

A special meeting of the Illuminating Engineering Society is to be held at 8:15 on Thursday evening, February 14, in the Engineering Societies' Building auditorium, New York, to consider the whole question of lighting curtailment.

A paper will be presented by Preston S. Millar, general manager Electrical Testing Laboratories and chairman of the committee on war service of the Illuminating Engineering Society, giving figures dealing with coal consumption, including the coal employed for lighting throughout the country and the amount which may be saved; methods of accomplishing the results expected through the curtailment of lighting, present status of artificial lighting used for various purposes, and other pertinent facts.

The following is a list of those who have been invited to speak personally or send a representative to discuss this question: Albert H. Wiggin, Federal Fuel Administrator for New York; Harry T. Peters, member of the conservation and advisory committee of the New York State Fuel Administration; John W. Lieb, chairman National Committee on Gas and Electric service; R. E. Enright, commissioner of police; Nicholas J. Hayes, commissioner of water supply, gas and electricity, New York; Dr. Colman W. Cutler, chairman illumination committee, National Committee for the Prevention of Blindness; Ernest T. Trigg, chairman committee on coal conservation, United States Chamber of Commerce; Dr. Edward B. Rosa, acting director National Bureau of Standards; L. B. Marks, chairman national lighting committee, United States Committee of Labor; Frank W. Smith, chairman lamp committee, National Electric Light Association. Representatives of the American Institute of Electrical Engineers and American Gas Institute are also expected to participate.

Colorado State Association of County Commissioners.

The Colorado State Association of County Commissioners, in convention at the Albany Hotel, Denver, reelected its president, B. A. Banta, of Colorado Springs; T. W. Monell, of Montrose, secretary-treasurer; Sam Greenwood, of Boulder, first vice-president; Neil McKay, of Gilpin, second vice-president; T. B. McMahon, of Telluride, third vice-president.

The convention was one of the best attended since the inception of the organization.

Nebraska Engineering Society.

The fourth annual meeting of the Nebraska Engineering Society was recently held at the University of Nebraska, at Lincoln. The meeting was markedly military in spirit. Professor J. N. Bridgman gave an illustrated talk on military engineering, and Colonel L. H. Roberts (U. S. A., retired) recounted some military reminiscences. Professor George R. Chatburn, delivered an address on "Improved Highways a Military Asset," and state engineer George E. Johnson read a paper on "Federal Aid on State Roads." George Campbell, senior highway engineer, the Office of Public Roads, spoke on the administration of federal aid roads and also on the construction of the Omaha cantonment. Dean Milo S. Ketchum read a paper on "Engineering and the War," and Major C. E. Cook, O. R. C. (U. S. Geological Survey), spoke on mapping.

Ohio War Roads Convention.

Ways and means for promoting construction of war roads in Ohio were considered at a three-day joint conference held in Columbus, beginning January 30. The conferees included members of the Ohio Good Roads Federation, the Ohio Engineering Society and the County Commissioners' Association. Governor Cox, Clinton Cowen, state highway commissioner; the state highway advisory board, state senator Alderdorf, and other state officials took part.

A. S. Burleson, postmaster-general, sent James I. Blakeslee, of Washington, his fourth assistant, to address the convention on "Efforts Being Made by the Post Office Department to Establish Motor Truck Parcel Post Routes."

Governor Cox advocated improvement of national highways first, then country roads and, finally, city streets. Mayor George J. Karb, of Columbus, delivered the address of welcome.

That millions of dollars must be expended every year for repairing highways, and that the old methods of doing such work will no longer suffice, were statements made by A. H. Hinkle.

(Continued on page 124.)

INDUSTRIAL NEWS

Cast Iron Pipe.—Prices remain constant: Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

The Rensselaer Valve Co., Troy, N. Y., announces the following appointments in its sales organization, effective February 1, 1918: Charles L. Brown, sales manager, New England branch; A. E. Jones, sales manager, Chicago branch; George M. Keefer, sales manager, Pittsburgh branch, and John S. Warde, Jr., sales manager, New York branch.

The Roberts Filter Manufacturing Co., Darby, Pa., has recently been given the contract in Washington for the erection of the water works system and filtration plant in connection with the cantonment at San Juan, Porto Rico. This is in line with the special effort this company has made to devote its energies entirely to governmental work since the war activities commenced, and the plants which it has already constructed and has under construction make a notable record of worthy effort and achievement. The list of plants includes those at Camp Meade, Newport News, Hog Island and Annapolis Academy. The improvements in connection with the San Juan water works necessitated by the cantonment involves an expenditure of about $300,000.

Market for Road Equipment in Bradford, England.—According to consular reports, although such articles as trucks, skids and push-carts are used to a large extent here, there appears to be no inclination to import any from the United States, inasmuch as local manufacturers can and do supply adequately the demand. However, it is believed that a fair trade could be done in wheels, brackets, casters and similar parts if prices are satisfactory and deliveries reasonably quick. It is therefore suggested that those interested communicate with certain manufacturers of trucks who have expressed a wish to have quotations and catalogues of such articles. [These names can be obtained at the Bureau of Foreign and Domestic Commerce or its district or co-operative office by referring to file No. 96317b. A list of the principal Bradford wholesale hardware dealers and of the principal builders and contractors in this district can be obtained by referring to file No. 96317c.] Although many import restrictions now in force act as a deterrent to importers, connections for the sale or distribution of wheelbarrows, scrapers and similar earth-handling and grading articles would be of great value during the period of national reconstruction in England after the war, when many large undertakings and construction projects are to be carried out.

Exhibition of Trade Journals.—A splendid exhibition of trade journals, comprising a collection of twelve hundred, is on view at the public library and museum of Newark, N. J., from Jan. 13 to Feb. 12. This exhibit is a new example of the modern viewpoint of the librarian and museum director, John Cotton Dana, that a museum should be alive and creative, sensitive to national problems and ready for needed service in the industrial, technical and commercial life of the community. The periodicals shown in this exhibit are dramatically displayed and may be easily examined and studied by visitors. A large number have been attracted by this striking picture of the economic importance of the trade press.

NEWS OF THE SOCIETIES

(*Continued from page 123.*)

of the state highway department.

"The increased burden upon our highways has completely revolutionized systems and methods of road maintenance and repair," Mr. Hinkle declared. "The filling of small holes and depressions in the surface of an important road with loose stone, as was done in former days, is no longer a satisfactory method. Such repairs would be a waste under our present motor-truck and high-speed traffic.

"The real important feature of the system will be that some one person must be responsible for the up-keep of every road."

Indiana Engineering Society.

A general subject of discussion at the annual meeting of the Indiana Engineering Society, held at the Claypool Hotel, Indianapolis, January 24 and 25, was "The War as an Engineer's War." President C. Francis Harding, of the society, started the discussion with his opening address.

Concrete pavements were discussed by W. E. Graves, assistant city engineer of South Bend, and C. D. Franks, of the Portland Cement Association. E. B. Smith, of Laporte, read a paper on "Recent Developments in Brick Paving," urging standard specifications.

At another session representatives of the public utility corporations discussed the need of higher rates because of greatly increasing costs. George Hubley, general manager of the Merchants' Heat and Light Company, Indianapolis, presented figures on the subject.

W. S. Moore, state highway engineer for the Indiana state highway commission, was elected president of the society, and G. A. Young, of Lafayette, was elected vice-president. J. S. Wilkins, of Connersville, and W. H. Insley, of Indianapolis, were selected as members of the board of trustees. Charles Brossmann, of Indianapolis, was re-elected secretary.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

A SEWER SYSTEM and SEWAGE TREATMENT PLANT are to be built by Jerome, Ariz. Plans and specifications for the improvement were the work of the engineering firm of Olmsted & Gillelen.

Clinton, Okla., is making PAVING IMPROVEMENTS. Plans and specifications for the work were prepared by the Benham Engineering Co.

A SANITARY SEWERAGE SYSTEM is to be built by Laurens, Ia. The city has retained as consulting engineer C. H. Currie.

A SEWAGE DISPOSAL PLANT is to be built by Parsons, Kans. Plans are being prepared by the consulting engineering firm of Black & Veatch.

Buhl, Idaho, is planning the installation of a new WATER SUPPLY SYSTEM. The city's consulting engineers are Burns & McDonnell.

The city council of Newburgh, N. Y., is considering the extension of the WATER SUPPLY and the development of a new source. A report has been presented on the subject by the consulting engineering firm of Hill & Ferguson.

Charleston, Ill., is contemplating the improvement of its WATERWORKS. The engineer for the work is G. L. James.

STREET IMPROVEMENTS are to be made in an addition of Tulsa, Okla. The Hughes Engineering Co. is drawing plans for the work.

Lyndhurst, N. J., is to improve several STREETS. The township has retained Thomas F. Bowe as consulting engineer.

Confronted with the problem of acute WATER SHORTAGE, Harrisburg, Pa., called in J. W. Ledoux, consulting engineer, to survey the situation and propose immediate remedies.

Hope, Kan., is to vote soon on the proposition to issue bonds for the construction of WATERWORKS. Preliminary plans are being prepared by the engineering firm of Riddle & Riddle.

Bancroft, Neb., is extending its WATER SYSTEM, installing an ELECTRIC LIGHT SYSTEM and constructing a MUNICIPAL BUILDING. Plans for the work were prepared by the Electrical Development Co.

Municipal Journal

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SNOW REMOVAL ON PENNSYLVANIA HIGHWAYS

How the State Highway Department, Through Its Maintenance Division, Is Keeping Open, for the United States Army Transport Trucks, Two Hundred and Twenty-five Miles of Roads Under Unprecedented Conditions.

By GEORGE H. BILES.*

Pennsylvania is co-operating with the national government in keeping an artery of travel across the state open and free from snow for the United States army transport trains operating between the central west and the seaboard. This route in our state extends from the Ohio state line, via Beaver Falls, Pittsburgh, Greensburg, Bedford, McConnellsburg, Chambersburg, Gettysburg and Littlestown, to the Maryland state line, a distance of approximately two hundred and twenty-five miles.

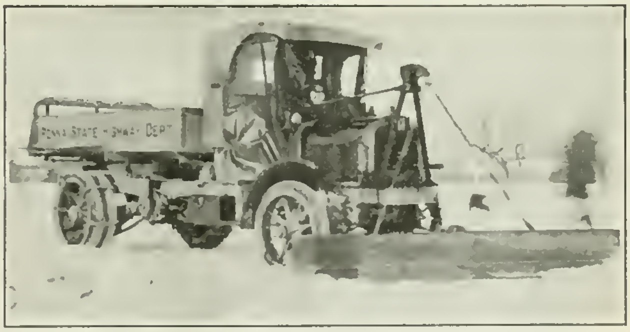
A system of operation for handling this work has been established by the Maintenance Division of the State Highway Department, which will be described briefly. Through arrangements made with the weather bureau office at Pittsburgh, weather forecasts are wired to the main office of the State Highway Department by which conditions can be anticipated and instructions issued immediately to the various districts to organize men and equipment for action. The field organization of the State Highway Department consists of the assistant engineer, who has control of all work in several counties, usually about five in number, followed by the superintendent of highways of the county, who has charge of all maintenance work; and under these men come the gang foremen, patrolmen, labor, etc. This organization has complete charge of this work in their respective counties and is under the direction of the second deputy commissioner in charge of maintenance.

Stationed at the larger towns, along the line of this route, are motor trucks equipped with snowplow attachments, road machines, drags, shovels, etc. The patrol system of about thirty-four men is engaged continuously in repairing and patrolling this highway, each man looking after his particular section, and this plan is a most important factor in reporting emergency conditions of consequence to the district head or superintendent, who reports by wire or phone to the main office direct. The caretaker is empowered to organize forces, if need be, to take care of conditions until the arrival of the superintendent. If the conditions are unusual, the superintendent reports by phone to the assistant engineer, who arranges to inspect and handle the work accordingly.

GASOLINE TRACTOR PULLING ROAD MACHINE.

MOTOR TRUCK USING SNOW PLOW.

HAND SHOVELING AS FORMERLY PRACTICED.


"CLOSE-UP" OF TRUCK WITH PLOW ATTACHED.

The report made by the caretaker is either by wire or telegram, which is followed by a postal-card report form, giving details, and addressed to the main office at Harris-

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*Second Deputy State Highway Commissioner of Pennsylvania.

A CUT THAT REQUIRES CONSTANT VIGILANCE.

burg. This information is charted as soon as received and the same practice is followed upon the completion of the work. If the drifts are abnormal and the road is not opened within twenty-four hours, the office must be advised by wire, and in this way headquarters is in direct touch and control of the entire route at all times.

The first snow storm of consequence this winter occurred December 7th and 8th and was general over the entire route and for many miles drifts averaged three to six feet in depth. The work was begun by breaking a track through the drifts with teams and drags. This was followed by the road machines, or trucks with the plow attachments and shovelers. Turn-outs were made along the line and thereafter the road widened out to a width of between fourteen and sixteen feet, depending upon the location. The entire travelable width of roadway was finally opened in order that traffic would not track and cut through the road surface during periods of freezing and thawing. The snow at first was removed to within three inches of the road surface and what did not melt was afterward removed entirely. Through the deep cuts, after a track was broken, it was necessary to resort to shoveling.

As soon as any section of the road was opened, shovelers followed, cutting openings from the side to the ditches at various intervals along the road. When this work was completed, the road was again turned over to the caretaker, or patrolman, to look after the drainage details.

From observations taken since 1913, it has been found that at certain locations the construction of snow fences would be advantageous and economical and whereas it was impossible to put all the necessary fence in place this season, some of it has been constructed and before another season arrives, the remaining sections will be provided for.

There were certain sections along the line of the route where it became necessary to work night and day shifts, and since the organization was perfected, each succeeding storm has been handled with increased alacrity and efficiency.

In the beginning, the work was handled with the following organization and equipment, which has been augmented from time to time: 7 motor trucks and plows, 22 road machines, 20 drags, 105 teams, 3 tractors, and 200 men.

ROAD MAINTENANCE IN WISCONSIN.

The year 1917 showed considerable progress made by the state of Wisconsin toward securing better highways. Largely through the activities of the Good Roads Association, a State Trunk Highway Act was passed, and an amendment of the State Aid Law permitting the use of state aid on city streets, and another amendment providing that fifty per cent of the state-aid money, together with local money accruing under the State Aid Act, shall be expended in the construction of the state trunk highway system.

The State Trunk Highway Act was designed to secure a state highway system which has already been laid out and totals approximately 5,000 miles, connecting all county seats and cities of 5,000 and more. It requires that the state begin this year patrol maintenance of the entire 5,000 miles—not only the improved portions but, also those that as yet have not been improved. The state highway engineer, A. R. Hirst, has worked out a system of thoroughly centralized supervision and coordinated execution of this patrol work. The patrolmen will be provided with teams or motor trucks, light road graders, and the regular equipment of small appliances. Their duties in the case of unimproved roads will be to drag the roads and keep the surface smooth and well-crowned and the drains open, removing obstructions and in general keeping the roads in the best possible condition. It is planned to begin patrol work of the roads next May.

SMALL ROAD MACHINE USED ON LIGHT SNOW.

Another feature of the bill is the road marking. The traffic highways will be numbered and signs giving the number of the road will be placed throughout the system, and the state will issue a map showing the location and number of each road in the system.

For building this system, it is proposed to spend nine million dollars for the period ending July, 1921, with which it is expected that one-fourth of the system can be built.

Another law, which becomes effective January 1, 1919, is known as the "Wide Sleigh Law" and provides that no draft sleigh shall be manufactured or sold unless the distance between runners measures 4 ft. 6 in. from center to center.

MUNICIPAL MANUFACTURE OF MATERIALS.

Some of the officials and official bodies of Detroit, Mich., are considering the advisability of having the city manufacture brick and creosoted wood paving blocks, a part, at least, of the brick to be used for constructing sewers. The city clerk, Richard Lindsay, declared a few days ago that the city was at the mercy of a brick makers' ring and that the only method by which it could secure fair prices for sewer construction appeared to be by manufacturing its own brick. (No suggestion appears to have been made that concrete be substituted for brick, although a much greater number of large sewers have been built during recent years of the former than of the latter material.) In addition, the charter commission, in its draft of the chapter to govern the department of public works, has provided that the city may enter into the business of manufacturing brick and creosoted wood blocks, and may erect and maintain a garbage disposal plant. The commission suggested that making bricks and paving blocks would enable the city to keep all employees of the public works department at work during the winter months.

PROGRAMS FOR WAR ROADS

Selecting Roads That Are Most Essential—Saving Time in Construction—Type of Pavement—Traffic to Be Carried.

In a paper before the convention of the American Road Builders' Association, Geo. C. Diehl, county engineer of Erie Co., N. Y., and chairman of the Good Roads Board of the American Automobile Association, gave some very timely suggestions for the preparation of a program for highways which will assist in the war preparation of the United States, the title of the paper being "How to Lay Out and Justify a Program of War Roads." This paper is abstracted below:

To justify any construction program, it is necessary that such construction will help win the war. Road construction projects from this point of view may be divided into three classes. First: Those which assist in the war program; second: Those which retard the war program; third: Those which do not interfere with the war program. There are many ways in which roads may assist, but to simplify this discussion, only the view point of how highways can assist the railroads was considered. A vital problem at present is how haulage over roads can be employed to release locomotives and cars and relieve congestion at terminals and freight houses.

Under the first class might be included roads that radiate from railroad shipping points and those that parallel railroad lines. As railroads are already over-crowded, the radiating roads, which serve as feeders, are not urgently needed, and the principal effort should be to concentrate on roads that approximately parallel railroads.

To even superficially study the subject, it is necessary to assume a period for the duration of the war, for it is apparent that if the war is to end within a year the improvement of these parallel roads should be temporary and speedy, letting the permanent improvement wait. One Congressman wisely said that it is far better to prepare for a war of seven years and have it last seven months than to prepare for a seven months' war and have it last seven years. It would seem wise to assume that the war will last for three years or more, and therefore to construct the parallel roads in the most substantial and durable manner.

HEAVY PLANK DRAG USED TO BREAK THE FIRST TRACK IN SNOW DRIFTS.

In deciding upon the roads to be so improved, it is necessary to fix the approximate length of motor vehicle haul. This has been stated by individuals to be from 50 miles upward. The daily distance for motor vehicle parcel post delivery is 135 miles, and it is likely that 150 miles daily would be a safe figure on which to base calculations. War roads, therefore, would not be continuously improved across the country, but by overlapping of zones of local service there would be improved stretches for four or five hundred miles. There would probably be some special roads of greater length, for example, from Detroit, Mich., to the Atlantic seaboard, for the transportation of motor trucks to be used by the government.

Elements which enter into this problem include availability of local material, time required for construction, ability to provide suitable detours, and the number of cars and locomotives that would be released.

It is apparent that, if two roads are of equal length and their conditions are equal, that which can be built of local material without using railroad haulage would be the more desirable. Also, the road which could be built in the shorter time would be preferred.

It may be assumed that these highways will be used only for local travel and not for through travel. The traffic carried may be divided into passenger, freight, express, and mail. The possibilities of moving passengers by motor vehicles are almost unlimited, as there are today more than 4,000,000 passenger cars in this country, which would give a total greater capacity of passenger-miles than all coaches of the steam and electric railroads combined.

Greatest relief to the railroads can be provided where the centers of population, production and distribution are close together, which is the condition in the New England, Eastern and Atlantic seaboard states. It is now possible to motorize the local passenger business in many sections of the east. This would eliminate possibly 75% or more of the local passenger trains in that section; and if through passenger trains refused to carry local passengers, a considerable percentage of through trains would be eliminated. Local freight, especially the smaller units, could likewise be transported by motor. Local express and mail packages could be carried over the highways and thus greatly relieve the railroads.

Many elements must be considered to determine which roads would give the greatest relief per dollar expended and in the shortest time. It is suggested that the state highway commissioner in each state determine the sections of highways which would best serve this purpose, consulting for this purpose a committee consisting of a leading railroad official, who would be in possession of all facts pertaining to the character and volume of local freight and passenger business, and a representative from chambers of commerce or commercial bodies. This committee, cooperating with the Highways Industries Committee (whose organization was effected last month in Chicago), could ascertain with reasonable exactness and in a very brief time the highway construction that would afford the greatest relief. The reports of the several state highway commissioners could then be transmitted to the Highways Transport Committee or suitable federal authorities, who would definitely determine which sections of highway should be built. The state highway commissioner could then promptly proceed to prepare plans, advertise for bids and let the work, all the govern-

ROAD MACHINE DRAWN BY TEN HORSES.

ment agencies cooperating toward a maximum speeding up of road construction.

One method of saving time would be to eliminate the preliminary surveys used for computing the amount of earth-work, and estimating this instead. Preliminary surveys could be simplified, particularly in states where the country traversed is comparatively level, final grades frequently being established just before construction begins.

After the locations of war roads are fixed, it is important that the most durable types of construction be adopted, as the number and weight of vehicles are sure to increase enormously, possibly carrying more freight than that carried by the railroads. On the main roads, it is altogether likely that the types will be limited to reinforced concrete, monolithic brick on concrete base, and possibly bituminous concrete. The various other forms of broken stone roads will not be suitable on the main highways. Without going into detail, reports of the cost of maintenance of various state highway commissions, where great mileages of roads have been constructed, substantiate this last statement.

For such highways, widths heretofore adopted will prove inadequate. Three-ton trucks traveling at 15 miles an hour or a half-minute headway, would convey 3,600 tons in one direction in a 10-hour day, or 7,200 tons in both directions. This is only the amount carried by one or two modern freight trains, and it would seem necessary to provide for two lines of traffic in each direction. Types which readily lend themselves to widening should be adopted, as much widening will be done in the future and the expense of this should be reduced to a minimum. Preference must be given to roads that do not require resurfacing or frequent repairs, as the war roads must not be closed.

For intelligently designing highways as well as bridges, maximum loadings must be adopted, this including not only total load but wheel load and length of wheel base. Motor vehicle manufacturers could then construct cars consistent with such system of loading, and cities and states would be warranted in forbidding travel over highways and bridges which did not conform to such system.

Cost of highway construction bears a definite relation to tonnage. If enormous increase is contemplated in the latter, the public must be prepared for highway expenditures far in excess of those of previous years, particularly in the case of the main trunk lines.

Highways must be kept free from obstruction caused by snow, as the roads must be used every day in the year. A comprehensive handling of the snow problem is a task too large for the average town, and this should be undertaken by the county or state. Similarly the taxable assets in the several townships are not sufficient to provide the amounts required to maintain such highways and bridges, and it is becoming apparent that the township should be abolished as a unit of highway administration, leaving the state and county to carry on work outside of incorporated places.

Economic theories of railroad construction have been so developed that it is possible for a railroad to determine the exact expenditure that would be justified to eliminate a foot of rise and fall or a degree of curvature, and if the highways are to carry the enormous motor vehicle travel which is anticipated, then similar economic theories should be developed for them. To illustrate: On a highway that carries 2,000 3-ton trucks daily at a rate of 6c a ton-mile, the cost of haulage would amount to $360 for each mile per day. If the highway were lengthened 1 mile, the increased cost of hauling would therefore amount to upwards of $125,000 a year, which capitalized at 8% for sinking fund and interest charges, would justify an expenditure of $1,500,000.

Before adopting a maximum grade, it would be necessary to determine whether trailers were to be used, and if so, the total weight of the trailers and loads as compared with the tractor. It does not seem practicable to reduce maximum grades to 0.5 ft. per hundred feet, as on railroads, but, on the other hand, distances can be saved by accepting a higher maximum grade. As an illustration, the distance from Albany, N. Y., to Pittsfield, Mass., is 50 miles by rail but only 38 miles by highway.

A traffic census should be taken at frequent intervals, as a controlling factor in many cases will be the cost of moving a ton a mile. Charts can be prepared showing the relation and classes of traffic in proportion to population and amounts of production. The curves on charts prepared in states where improved highways are more prevalent would indicate to a considerable extent the type of construction, width, grades, alignment, etc.

With such a highway program, production would be greatly stimulated and territory not now available for agriculture would be opened up and economic conditions bettered along many lines. While it is impossible in the rapid building of war roads to adhere closely to the lines indicated, yet all of these matters should be kept in mind.

REPAIRING BITUMINOUS PAVEMENTS.

Editor Municipal Journal, New York City:

Dear Sir—On Feb. 2nd you published an abstract of a paper by Geo. H. Biles, Sec. Deputy Highway Commissioner of Penn., concerning Repairing Bituminous Pavements.

Under the head of "Bituminous Concrete," the article states that "cracks are the most common and earliest defects appearing in bituminous concrete pavements." It seems to me that this statement can be further emphasized. In pavements of this type, properly designed and constructed, cracks constitute at least 90 per cent. of all defects. In our 32 miles of this type of pavement we have experienced practically no other trouble, except in a very few cases where the asphaltic concrete has pushed under traffic. The pavement on those streets where the pushing has occurred was some of the first laid in Oak Park, and the so-termed "Topeka mixture" was used. These streets have been subjected to heavy motor truck traffic. The one exception is a boulevard pavement carrying excessive, concentrated motor traffic, and has been down four and a half years. This pavement has developed a tendency to push slightly at several points throughout its length; in each case this pushing has appeared in the tracks of both east and west bound traffic.

We have examined the condition of concrete base beneath a representative number of cracks (both very marked and very small cracks being chosen) in all parts of the town, and in every case found a crack in concrete base either directly under that in the surface material or only a very slight distance therefrom. It is our belief that in at least 98 per cent. of these cases a crack in asphaltic wearing surface means a crack in concrete base, directly beneath or in close proximity. This statement is substantiated by practically all asphalt pavement authorities in the country, both engineers and contractors.

In no case have any of our asphaltic concrete pavements laid on macadam base developed cracks, including pavements 7 years old.

The cause of cracks in asphaltic wearing surface is undoubtedly in the base, provided the mixture carries a reasonably correct amount of bitumen and is properly mixed and placed, except in those very rare instances where some local case of improper drainage or defective support may cause cracking, and, of course, in pavements which have served their time without resurfacing. Just so long as asphaltic wearing surfaces are laid on concrete base will they crack; and there is apparently no effective way of overcoming this tendency, or of permanently repairing such cracks.

Mr. Biles says that "cracks, unless caused by some serious form of disintegration, can be repaired by cleaning them out thoroughly and pouring them full of hot or cold bituminous mixture of proper grade and then tamping or wedging stone chips into the cracks, thoroughly sealing them." Perhaps this method would work out in those extremely rare cases where cracks occur in pavements on macadam base, but it certainly will not give the desired result in cracks due to cracks in concrete base, simply because the wearing course, owing to its mechanical bond with the concrete, has no chance to recover from the shock of the pulling action, and therefore must crack. We have tried this scheme in many instances and it has not given good results. We have also cut out and relaid the surface material, only to find after another winter that the crack had reappeared, and in many cases a crack appeared at both edges of the patch. We have also cut out and relaid both base and top and in practically every case found that a crack appeared at both edges of the patch.

We have seen the rolling of wavy surfaces during hot weather (recommended by Mr. Biles in some cases) tried in our own city, also in other cities; and while temporary relief was perhaps obtained, the waves reappeared as soon as traffic had been resumed for any length of time.

Mr. Biles recommends a light surface application of bitumen on pavements which have begun to lose their "life." This we believe is very practicable and will give good results, though there is still doubt as to just what grade of oil to use, in order to get the best results at a minimum cost.

Very truly yours,
H. W. SKIDMORE,
Construction Engineer,
Dept. Public Works, Oak Park, Ill.

CONVENTION OF AMERICAN ROAD BUILDERS' ASSOCIATION

Narrative of the Fifteenth Annual Meeting Held at St. Louis Last Week—Road Building as a War Measure—Federal Government Urged to Formulate Definite Road Policy—Snow Removal Essential.

The fifteenth annual convention of the American Road Builders' Association was called to order promptly on time at 10.30 A. M., February 4th, although the tie-up caused by snow in the north and east delayed the arrival of many. Before the end of the convention, about 550 had registered. With a few exceptions, the program was carried out as published and most of the papers received animated discussion. That the papers would be of high quality was indicated by the names of their authors.

The keynote of the convention was the continued building of roads as a war measure. Nearly all the speakers strongly urged speeding up the building of such main roads as will aid in winning the war by (1).—Furnishing continuous routes for delivery of auto-trucks and their loads of auto cars and for war materials under their own power from the factories to the point of shipment, as outlined by Raymond Beck of the Highways Transport Committee, one of whose duties is the selection of such routes and the securing from state and county highway authorities the construction or temporary repair of miles of roads needed to fill the gaps in the most valuable routes.

(2).—Constructing of roads that will relieve the railroads of local freight, passenger, express and mail traffic, so that they can apply themselves to the handling of through traffic, applying this most intensively near the port terminals so as to relieve the freight stations, docks and warehouses at the railroad terminals at shipping points.

(3).—Constructing such local roads as can be constructed with local materials and machinery which will not tax the railroads for delivery.

The fact that these roads are in many cases directly for military purposes, and in other cases indirectly so by relieving the congestion caused by military usage of these and other transportation systems, warrants asking the aid of the national government in many cases, and a plan for making the application of this aid most efficient, economical and speedy, was outlined in Mr. Diehl's paper.

The importance of the motor truck as an emergency method of relieving traffic congestion was strongly emphasized and the probable development of the use of motor trucks for deliveries from factory or central distribution points for farm purposes to store or consumer was quite clearly outlined.

The maters of width of highway, economical size of truck, coordination of truck, tire and road design, were all recognized as matters of prime importance, and methods of securing the cooperation of road engineers, truck manufacturers and truck users in fixing the character of pavement, size and design of truck, and speed and regulations of the same were quite thoroughly discussed. Traffic regulation came under this head and, after some valuable discussion of Mr. McLean's important paper, a special committee was appointed to consider the formulation of uniform traffic regulations for all the states, with instructions to report to this convention if possible.

While the general construction of roads in accordance with former programs was not recommended, the extensive construction of such roads as are important in winning the war, either directly or indirectly, was strongly urged, and the securing of government and state aid therefor. Also the preparation of plans and programs for more general road construction as soon as the war is over was strongly recommended. Mr. Bradt's paper outlined the Illinois plan, under which it is proposed to carry and redeem the $60,000,000 bonds to be issued for road construction out of the proceeds of automobile licenses, already increased with this purpose in view. Texas counties reported similar plans and Kansas has many contracts ready for letting, few of which, however, will actually be constructed until after the war.

The exhibit feature of the convention was much smaller than usual, this being intentionally so on account of the present difficulties of transportation and the desire to keep down comparatively unnecessary expenses. The ball-room of the Statler Hotel, in which the convention was held, was neatly laid out in booths in which samples and literature were exhibited and which were used as centers for the representatives of the manufacturers who were on hand.

The first session, Friday morning, was devoted to addresses of welcome, by X. P. Wilfley (representing Governor Gardner) for the state of Missouri, Mayor Kiel in behalf of the city, Geo. D. Markham for the Chamber of Commerce, and A. C. McKibbin for the Missouri State Highway Board; which welcoming speeches were responded to by H. E. Breed, president of the association.

In the afternoon, W. A. McLean, deputy minister of highways of the Province of Ontario, reading a paper entitled "Traffic Laws in Relation to Highway Maintenance and Construction," which was followed by a brief discussion. "The Illinois Scheme of Financing by Bond Issue" was described by S. E. Bradt, superintendent of highways of Illinois. (This scheme was described in the issue of Municipal Journal for November 15th, 1917.) The evening session was devoted largely to screen pictures illustrating "The Roads in the Hudson River District with Unusual Construction Features," which were described by W. A. Welch, chief engineer, Palisades

Interstate Park Commission; "Road Construction in the Northeast Cantonments," described by Philip P. Sharples, manager of the General Tarvia Dept. of the Barrett Co.; and "Road Construction in the Other Cantonments" by A. N. Johnson, consulting engineer of the Portland Cement Association.

Tuesday morning, three papers were on the program, but one of them—"The Efficiency of the Motor Truck in Terms of Cost Per Ton-Mile" by R. E. Chamberlain—was not read until Wednesday. S. M. Williams, sales manager for the Garford Motor Truck Co., presented a paper entitled "The Highway and Its Relation to Transportation," which was read by A. E. Phelps. "The Delivery of the Motor Truck from the Factory to the Seabord Under Its Own Power" was described by Raymond Beck of the Highways Transport Committee.

Tuesday afternoon Geo. C. Diehl, county engineer of Erie Co., N. Y., and chairman of the Good Roads Board of the American Automobile Assn., gave some suggestions on "How to Lay Out and Justify a Program for War Roads," and J. C. Travilla, consulting engineer for the Dunn Wire-Cut Lug Brick Co., discussed "The Creation of a More Equitable Contract Between Highway Commissions and Contractors." Following this session there was a meeting of the Board of Directors of the Association and in the evening an entertainment and smoker in the hotel.

The last two days of the Congress were devoted to details of design, construction and maintenance. The practical papers of state highway engineers Older of Illinois, Upham of Delaware, Graham of Missouri, and chief engineers Fisk of St. Louis and Dunning of Ft. Oglethorpe were fruitful of discussion and filled their respective sessions full of interest. The motion picture exhibits were interesting as well as entertaining and the banquet crystallized the patriotic sentiment of the organization, though largely expressed through local speakers, who included banker Edward Hidden as toastmaster, postmaster Collin M. Selph, Capt. Roy Britain, editor Geo. S. Johns of the "Post-Dispatch," and secretary A. Campbell McKibbin of the Missouri State Highway Board. Of special note was the inspiring patriotic address of W. A. McLean, the deputy highway commissioner of Ontario, and the brief closing note of Mayor Holmes of Worcester.

The resolutions adopted by the Congress were brief and showed the strong intent of the organization and its members to support the Government in the present stress, suggesting some ways in which the organization and the official national and state organizations can be of service in the transportation problems within the country.

The principal resolutions regarding the policy of the Government in encouraging construction and adequate maintenance of roads essential to the progress of commerce directly in aid of the winning of the war; regarding snow removal and regarding uniformity of road signs are given below. The committees provided for have power to promote the adoption of their plans as soon as they are formulated so as to extend uniformity of treatment of these subjects as rapidly as possible among the States of the Union.

A strong resolution endorsing the methods of conduct of the war by the Administration and pledging the aid of the organization and its individual members passed unanimously and enthusiastically.

There were the usual resolutions offering thanks for courtesies and one accepting an invitation from the Governor of Arkansas to attend the U. S. Good Roads Association meeting in Little Rock, April 15-19.

A committee of five on uniformity of regulations of traffic was appointed to confer with state authorities and to study and work out as rapidly as possible recommendations to state authorities of uniform regulations of speeds, weights, dimensions, wheel weights, tires, chains, lights, etc.; reports to be made to the state authorities and to the Association. Meeker of New Jersey was made chairman, and Terrell, Potts, McLean and Rountree are the other members.

Resolutions Adopted by the Association.

WHEREAS, highway transportation has become a vital factor in the transportation facilities of the nation where suitable roads for its use exist, and

WHEREAS, the present use of this means of transportation will be greatly curtailed and an enormous road investment loss be sustained unless said roads are properly maintained, connected and extended, and

WHEREAS, the extension of this mode of transportation would afford much needed relief during periods of railroad congestion and facilitate the transportation of war and other necessities, and

WHEREAS, funds have been made available by federal, state and county appropriations for use in maintenance of public roads, and

WHEREAS, in order that full efficiency of roads already constructed may be attained, it is necessary that certain connecting links and extensions be built, and

WHEREAS, in order that the expenditure of these funds may be so directed as to yield the greatest measure of service to the nation in the present crisis, and

WHEREAS, both maintenance and construction of roads depend largely upon the movement of materials over the railroads and the road-building policy of the Federal government.

NOW, THEREFORE, BE IT

RESOLVED, that the American Road Builders' Association Convention urge upon the Federal government that it formulate or cause to be formulated and promulgated at the earliest possible date a definite statement of Federal policy concerning road maintenance and essential construction and the encouragement and aid which the Federal government, by assigning freight car service will give towards carrying out the plans recommended by the different states through their highway officials during the season of 1918. And be it further

RESOLVED, that this Association, through its Executive Committee, does hereby tender its full cooperation and assistance in carrying out such a road policy. And be it further

RESOLVED, that a standing committee of seven (7), of which the President shall be a member and Chairman, appointed by the President from the members of this Association representing all sections of the United States, be appointed to present these resolutions to and confer with Secretary-Treasurer McAdoo, the Director-General of Railways, and they shall continue their activities on these lines until discharged by this Association and shall report from time to time in order that their information shall be available to the membership of this Association.

WHEREAS, in the present national crisis it is necessary that all transportation facilities be utilized to the fullest extent, and

WHEREAS, maximum efficiency in highway transportation in many sections of the United States is not possible at the present time on account of snow blockades, therefore be it

RESOLVED, that it is the sense of this convention that provision should be made and funds provided for the necessary snow removal during the winter of 1918-1919 on trunk lines connecting large cities or industrial plants and on other roads which carry a heavy motor truck traffic. And be it further

RESOLVED, that copies of these resolutions be forwarded to the Department of Agriculture of the Federal government, to the Governor and the State Highway Department of each state so affected.

WHEREAS, there is a general need in the United States for the erection of highway signs and for a more comprehensive and uniform system of marking roads, both as to directionary and precautionary signs, therefore be it

RESOLVED, that a committee of seven (7) be appointed by the President to take up and study this question, and to submit a report with recommendations at a subsequent meeting of this Association.

STREET PAVING DURING 1917

Annual Presentation of Data Concerning Paving Done by Cities—Furnished Specially for These Tables by Officials of Six Hundred Cities—Amount, Construction Details and Cost of Pavements—Paving Materials Locally Available.

ROAD MATERIALS LOCALLY AVAILABLE.

City and State.	Distance in miles to nearest adequate source (excluding railroad haul) for			Are Roads Suitable for Motor Truck Transportation?
	Sand	Gravel	Crushed Stone	
Alabama:				
Dothan	120	120	...	soon; not yet
Florence	1½	1½	...	Yes
Gadsden	2	1	1	Yes
Huntsville	None nearby	1-5.	2	No
Montgomery		2	...	Yes
Selma	1	1	None	Yes
Troy	52	52	150	Yes
Tuscaloosa	1	1	None	Yes
Arizona:				
Globe	½	½	None	Yes
Nogales	1	None	¾	Yes
Phoenix	2	2	2	Yes
Arkansas:				
Ft. Smith	½-1	½-1	½-1	Yes
California:				
Alameda	15	15	3	Yes
Berkeley	25	25	4	Yes
Eureka	1½	10-15	6	Yes
Long Beach	30	30	30	excellent
Marysville	1	1	24	Yes
Oakland	3	3	3	Yes
Pasadena	All secured in city			Yes
Petaluma	35	35	1½	Yes
Pomona	1-1½	1-1½	...	Yes
Redlands	2	2	11	Yes
Richmond	5	40	3	Yes
Riverside	1	..	2	Yes
San Bernardino	1-2	1-2	3	Yes
San Francisco	5	..	...	Yes
San Jose	1-5	1-5	10-50	Yes
Santa Ana	1½	1½	30	Yes
Santa Barbara	9	40	40	Yes
Santa Monica	40	..	10	Yes
Colorado:				
Boulder	1	..	1	Yes
Canon City	3½	3½	3½	Yes
Colorado Springs	1	1	40	Yes
Ft. Collins	¾	¾	15	Yes
Leadville	2	2	½	Yes
Pueblo	1	1	...	Yes
Connecticut:				
Ansonia	1½	1½	by trolley	Yes
Bristol	1	1	5	Yes
Derby	1	1	by trolley	Yes
Greenwich	½-1	½-1	½-1	Yes
Hartford	2	10	5	Yes
Middletown	1½	None	by trolley 8 mins.	Yes
New Haven	½	½	2	Yes
Southington	1½	1	9	Yes
Stamford	All by boat		...	Yes
Wallingford	1½	..	...	No
Willimantic	1	1	...	Yes
Winchester	1½	1½	None available	Yes
Delaware				
New Castle	1	2	7	Yes
Wilmington	None	None	3	Yes
District of Columbia:				
Washington	3-8	..	...	Yes
Florida:				
Palatka	¼	¼	...	Yes
Pensacola	Short	45	None available	Fair
Sanford	No local supplies			
Georgia:				
Americus	No local supplies			
Athens	2	..	2	Yes
Rome	in city	in city	3	Yes
Savannah	3	.150	150	No
Idaho:				
Boise	1	1	1	Yes
Coeur d'Alene	1	1	2	Yes
Lewiston	1	1	1	...
Moscow	1½-3	90	10	only for sand
Pocatello	1	1	1	Yes
Twin Falls	None available		½	only for rock
Illinois:				
Alton	¾	..	¾	Yes
Aurora	12	12	25	mostly gravel
Canton	½	½	½	Yes
Champaign	70	70	130	No
Chicago	30	30	8	Yes, except sand
Illinois (Continued):				
Chicago Heights	20	20	6	Yes
Cicero	2	2	2	Yes
Collinsville	1¼	1¼	½	Yes
Decatur	2	2	None	Yes
DeKalb	No local materials available			
Dixon	1½-2	1½-2	½-1½	Yes
E. St. Louis	3	..	7	Yes
Evanston	No suitable local material			
Freeport	None	None	Quarry in city	Yes
Gibson City	20	20	75	No
Gillespie	3	3	...	Yes
Granite	in city	in city	in city	...
Highwood	½	1½	½	Yes
La Grange	6	None	15	Yes
Marion	60	..	...	No
Moline	By river	2 mile haul		Yes
Normal	1½	..	...	Yes
Oak Park	40	8	8	some
Pekin	1	1	Must be shipped	Yes
Peoria	2	2	2	Yes
Pontiac	60	60	60	Yes
Springfield	All material shipped in			No
Sterling	1	1	...	Yes
Streator	1	1	1	Yes
Waukegan	1½	1½	• 1½	Yes
Indiana:				
Anderson	¾	¾	...	Yes
Crawfordsville	2	2	½	partly
Crown Point	50	50	50	Yes
E. Chicago	20	20	20	Yes
Ft. Wayne	1½	1½	1½	Yes
Frankfort	25	25	25	Yes
Gary	7	7	30	good
Greencastle	2	2	¾	Yes
Hartford City	1	1	8	Yes
Indianapolis	2	2	None	Yes
Kendallville	13	13	50	No
Madison	½	½	3	Yes
New Albany	in city	in city	...	Yes
Noblesville	1	1	107	Yes
Peru	1	1	1	Yes
Portland	1	1	10	not for heavy trucks
Richmond	2	2	6	Yes
Seymour	3	3	1	Yes
Shelbyville	in city	..	11	Yes
South Bend	2½	2½	None	Yes
Sullivan	10	10	None	Yes
Terre Haute	2	2	...	Yes
Iowa:				
Algona	1	None	None	Yes
Ames	1½	1½	150	Yes, except for stone
Atlantic	1	1	1	...
Bloomfield	None available			
Boone	5	5	50	Yes
Burlington	On river front		None near	Yes
Carroll	20	20	20	Fair
Cedar Falls	1	1	¾ to boats	Yes
Cedar Rapids	2	..	2	...
Charles City	1	1	1	Yes
Clinton	No hauling required			
Creston	No local material available			
Davenport	River front	2	8	Yes
Denison	35	35	35	Yes
Dubuque	2	2	2	Yes
Eagle Grove	20	4	150	Yes
Emmetsburg	1	1	13	Yes
Estherville	2	2	None	Yes
Fairfield	5	..	23	Yes
Fayette	3	none available		No
Ft. Dodge	2	2	None	Yes
Glenwood	30	30	40	No
Grinnell	50	50	50	No
Independence	1	1	...	Yes
Indianola	15	15	40-120	...
Iowa City	1-5	30	50	Yes
Marshalltown	½-3	½-3	None	Yes
Monticello	2	scarce	3	Yes
Muscatine	1	1	1	Yes
New Hampton	All materials shipped in			
Perry	2	2	40	Yes
Sioux City	All materials shipped 125 miles by rail			
Spencer	2	2	2	Fair
Kansas:				
Arkansas City	1	1½	None	No
Atchison	1	1	Yes	1

ROAD MATERIALS LOCALLY AVAILABLE.

City and State.	Distance in miles to nearest adequate source (excluding railroad haul) for Sand	Gravel	Crushed Stone	Are Roads Suitable for Motor Truck Transportation?
Kansas (Continued):				
Beloit	3	None	5	Fair
Cherryvale	½	½	...	...
Columbus	15-20	15-20	15-20	Yes
Council Grove	None	¾	¾	...
Emporia	¾	3	¾	Yes
Ft. Scott	None locally		1	Yes
Gerard	None locally		2	in dry weather
Gypsum	20	20	...	Yes
Independence	Shipped in	..	1-5	Yes
Iola	None	5-6	1	partly
Kansas City	1½	None used	2	generally
Leavenworth	⅛-3	None	1-3	in dry weather
Manhattan	1½	1½	2½	Yes
Neodesha	..	..	2	Yes
Olathe	20	150	1	Yes
Osawatomie	..	..	1	Yes
Ottawa	1	1	2	Yes
Parsons	12	12	½	for rock
Pratt	in city	..	None	Yes
Rosedale	3	1	1	Yes
Salina	2	None	here	for sand
Topeka	1	1	1½	Yes
Wellington	13	35	25	dirt
Kentucky:				
Carlisle	¼-1¼	¼-1¼	75	Yes
Frankfort	28	28	¼-1¼	Yes
Louisville	All available in city limits			
Ludlow	½	½	...	Yes
Madisonville	1½	1½	1½	Yes
Maysville	1½	1½	1	Yes
Paducah	Secured from Ohio River			No
Louisiana:				
Kentwood	½	½	None	Yes
Lake Charles	75	75	...	No
New Orleans	All shipped in			
Natchitoches	55	55	50	No
Shreveport	2	2	2	Yes
Maine:				
Augusta	1	1-7	1-7	Yes
Bath	1	2	Imported	Yes
Gardiner	¼	1	1	Possible
Lewiston	1	1½	1	Yes
Portland	3	None	2½	Yes
Rockland	2	2	1½	Yes
So. Portland	1	1	None used	Yes
Waterville	1½	1½	Varies	Yes
Maryland:				
Cumberland	3	None	3	Yes
Frederick	1-2½	1½	1½-3	Yes
Massachusetts:				
Adams	½ to ¾	½ to ¾	½ to ¾	Yes
Braintree	1	1	1-3	Yes
Brockton	1	1	1	
Cambridge	3	3	2	...
Greenfield	1½	1½	1	Yes
Haverhill	1	1	1	Yes
Lawrence	Within city limits		2-3	Yes
Lowell	2	2	2	Yes
Lynn	1	1	1	Yes
Marlboro	2	2	½	Yes
New Bedford	3	3	3	Yes
Newton	1	1	1-5	Yes
No. Adams	1	1	1	Yes
Northampton	3	3	3	Yes
Norwood	2	2	2	Yes
Peabody	1	1	1	Yes
Revere	5-20	1	2	Yes
Waltham	1	2	2	Yes
Webster	1½	½	1½	Yes
Westfield	1½	2	4	Yes
Woburn	1	1	2	Yes
Worcester	Distances vary			Yes
Michigan:				
Adrian	2	8	30	Yes
Alpena	1½	1	2	Yes
Ann Arbor	1-3	1-3	None used	Yes
Battle Creek	1	1	...	Yes
Bay City	2	2	2	Yes
Cadillac	1¼	1¼	100	Yes
Detroit	6	6	18	Yes
Dowagiac	2	2	...	Yes
Flint	5	5	70	No
Grand Haven	½	½	None	Yes
Grand Rapids	Available within city			
Holland	30	30	300	No
Houghton	1	1	1	Yes
Kalamazoo	2	2	None	Yes
Lansing	2	6	in city	Yes
Marquette	1	1	1	Yes
Port Huron	1	1	70	Yes, except for stone
Saginaw	3	1½	1½	Yes
Sturgis	1	1	None	Yes
Three Rivers	½	2	...	Yes
Minnesota:				
Austin	1½	1½	65	for sand & gravel
Brainerd	2	2	6	Yes
Faribault	1¾	1[illegible]	½	Yes
Hibbing	1½	3	4	Yes
Mankato	1-1½	1-1½	1	Yes
Minneapolis	Within city limits		...	Yes
Northfield	1	1	None	Yes
St. Cloud	1	1	1	Yes
St. Paul	2	2	2	Yes
Stillwater	1½	1½	in city	Yes
Virginia	2	2	2	Yes

ROAD MATERIALS LOCALLY AVAILABLE.

City and State.	Distance in miles to nearest adequate source (excluding railroad haul) for Sand	Gravel	Crushed Stone	Are Roads Suitable for Motor Truck Transportation?
Mississippi:				
Clarksdale	All comes by rail			
Columbus	1	1	...	Yes
Greenwood	1/3	1/3	1/3	Yes
Jackson	3	None available		
Vicksburg	1	1	None	Yes
Missouri:				
Bethany	1	1	1	No
Boonville	1	1	1	Yes
Brookfield	Only by railroad for 100 miles			
Cape Girardeau	1	3	2½	Yes
Carrollton	1	None available		Yes
Carthage	1	1	2	Yes
Excelsior Springs	1	..	1	Yes
Independence	None		1	Yes
Joplin	1½	1	1	Yes
Kansas City	All available in city		...	Yes
Kirkwood	3	3	½	Yes
Monett	None	1	1	Yes
Sedalia	40	1	5	for gravel & stone
St. Charles	1	None	None	...
Springfield	None	8	1½	possibly
Webb City	½	½	½	Yes
Montana:				
Anaconda	20	9	6	for sand & stone
Billings	2½	2¼	None	Yes
Bozeman	All by railroad			
Great Falls	1	2	...	Yes
Helena	70	2	2	for gravel & stone
Miles City	1	1	..	Yes
Nebraska:				
Grand Island	½	½	None	Yes
Hastings	30	30	100	depends on weather
Lincoln	3	3	45	usually
Omaha	20	20	20	Yes
Red Cloud	2	2	100	Yes
New Hampshire:				
Franklin	1	1	in city	Yes
Laconia	1-2	None	½-1	Yes
Nashua	1	1	1	Yes
New Mexico:				
Roswell	5	3	None	Yes
New Jersey:				
Bayonne	1½	1½	½	
Boonton	3	3	17	some
Camden	15	20	30	Yes
Elizabeth	30	30	6	Yes
Garfield	..	..	4	Yes
Irvington	15	20	4	Yes
Madison	2½	2½	7	Yes
Millville	5	5	40	No
Montclair	..	..	2	Yes
Newark	4	4	4	
New Brunswick	2	None	6	Yes
Newton	½	½	½	Yes
No. Plainfield	3-4	3-4	2-3	Yes
Nutley	2	1	1	Yes
Orange	15	None	2	Yes
Plainfield	None locally		2	Yes
Red Bank	1¼	1¼	1¼	Yes
Ridgewood	1	1	6	Yes
Rutherford	2½	2½	5-8	Yes
Westfield	None locally		2	Yes
West Hoboken	2	2	3	Yes
West Orange	Near	Near	Near	Yes
West New York	1	1	¼-2	Yes
New York:				
Albany	1½	1½	2	Yes
Amsterdam	4	..	1	Yes
Auburn	1½	..	1½-3	Yes
Binghamton	½-1	½-1	60	Yes
Buffalo	From Lake & River		in city	
Corning	3	3	...	Yes
Cortland	4	4	4	Yes
Elmira	1	1	1	Yes
Fulton	1	1	1	Yes
Geneva	6	6	6	Yes
Glens Falls	1	1	1	Yes
Gloversville	1½	1½	8	for stone
Haverstraw	1	1	5	Yes
Herkimer	1	1	8	Yes
Hudson Falls	1	None	1	Yes
Jamestown	Sand & Gravel in city limits			
Lackawana	4	4	1	Yes
Lancaster	1	1	11	Yes
Little Falls	2	..	1	Yes
Mamaroneck	2	2	2	Yes
New York:				
Bronx Borough	2	..	...	Yes
Queens Borough	1	1	1-2	Yes
Niagara Falls	2	2	3	Yes
No. Tonawanda	1	1	...	...
Ogdensburg	1½	..	1	Yes
Olean	4	4	...	Yes
Oneida	3	3	12	Yes
Oneonta	½	½	1½	Yes
Oswego	8	8	8	Yes
Rensselaer	1	1	10	Yes
Schenectady	1	2	...	Yes
Syracuse	5	2	4	Yes
Utica	No good local mat'ls			
White Plains	¾	None	None	Yes
North Carolina:				
Asheville	3	..	2½	Yes
Goldsboro	1¼	None	None	in good weather

ROAD MATERIALS LOCALLY AVAILABLE.

City and State.	Distance in miles to nearest adequate source (excluding railroad haul) for			Are Roads Suitable for Motor Truck Transportation?
	Sand	Gravel	Crushed Stone	
Greensboro	4	..	1	Yes
New Bern	1	None	None	...
Salisbury	2	..	5	Yes
Winston-Salem	2	None	2	Yes
North Dakota:				
Bismarck	50	50	250	...
Devil's Lake	3	6	...	Yes
Fargo	26	26	150	in dry weather
Wahpeton	1	20	200	No
Ohio:				
Ashtabula	1-3	1-3	...	Yes
Barberton	1	1	100	Yes
Bellefontaine	...	...	1	Yes
Bucyrus	...	...	6	Yes
Cincinnati	In city limits		15	Yes
Circleville	1	1	30	Yes
Coshocton	1	1	...	Yes
Defiance	Near	None	...	...
Delaware	None available		1½	Yes
E. Liverpool	Local		...	Yes
Findlay	None locally		In city	Yes
Fostoria	60	...	8	Yes
Fremont	1	...	1	Yes
Greenville	1½	1½	1½	Yes
Hamilton	1½	1½	...	Yes
Ironton	Sand and gravel shipped in; slag 2 miles			
Lakewood	15	15	...	Partly
Lancaster	1½	1½	...	Yes
Lima	1½	1½	1½	Yes
Logan	1	1	2	Yes
London	none available locally			
Lorain	Sand 30 miles by boat			Yes
Marietta	Sand and gravel in city			
Marion	3	3	3	Yes
Middletown	Gravel 1 mile; stone and sand by rail			
Newark	1	1	40	Yes
Norwood	No local materials available			
Painesville	1	1	By rail	Yes
Piqua	2	2	1	Yes
Port Clinton	By electric railway		...	Yes
St. Bernard	1	1	By rail	Yes
Sandusky	All locally available		...	Yes
Springfield	2	2	·5	Yes
Steubenville	1	1	None	Yes
Troy	1	1	8-30	Yes
Urbana	¾	¾	½	Yes
Van Wert	60	60	8	Yes
Wapakoneta	1	1	...	Yes
Washington	½	½	...	Yes
Westerville	12	12	12	Yes
Xenia	2	2	9	Yes
Youngstown	2	2	2	Yes
Zanesville	1½	1½	By rail	Yes
Oklahoma:				
Bartlesville	1	...	1-4	Yes
Elk City	2	2	...	Yes
Enid	3	None	125	Yes
Hartshorne	Shipped in		1	Yes
Kingfisher	2	None available		Yes
McAlester	6	6	20	Yes
Wagoner	15	15	...	Yes
Oregon:				
Ashland	1½	1½	1½	Yes
Corvallis	¾	¾	¾	Yes
Eugene	1	In city		Yes
Marshfield	22	50	5	No
Newburg	..	1	...	Yes
North Bend	10	24	10	In summer
Roseburg	2½	2½	2½	Yes
Salem	¼-2	¼-2	¼-2	Yes
West Linn	1	1	...	Yes
Pennsylvania:				
Beaver Falls	18	18	...	Fair
Bloomsburg	1½	1½	3	Yes
Bradford	2	15	2-6	Yes
Carlisle	1	1	1	Yes
Charleroi	1	By rail		Yes
Coatesville	...	...	3	Yes
Columbia	near	..	1	Yes
Duquesne	½	½	½	Yes
Easton	6	6	1	Yes
Franklin	...	1	...	...
Freeland	½	½	½	Yes
Greenville	½	½	None	Yes
Hanover	20	...	2	Yes
Hazleton	¾	¾	1	Yes
Hollidaysburg	3	..	3	Yes
Lansford	20	...	Near	Yes
Lebanon	1	None	1	Yes
Lewisburg	1	..	2	Yes
McKeesport	½	½	1	Yes
Meadville	2	2	None	Yes
Norristown	1½	...	3	Yes
North Braddock	1	1	1	Yes
Oil City	34	34	...	Fair
Old Forge	1	1	1	Yes
Olyphant	20	20	10	Yes
Punxsutawney	25	..	...	...
Pittsburgh	½-4	1½-4	...	Yes
Pittston	1	1	3	Yes
Rankin	1	1	None	Yes
Reading	2	None	1	Yes
Royersford	..	..	10	Yes
Sayre	2½	2½	60	No
Scranton	None	...	2	Yes
St. Marys	4	12	...	Part of time
Shamokin	20-30	Yes	In city	Yes
Tyrone	3	3	2	Yes
Waynesboro	10	...	City quarry	Yes
West Berwick	1/10	1/10	...	Yes
Wilkes-Barre	1	12	9	No
Wilkinsburg	4	4	37	Yes
Williamsport	1	1	2	Yes
Rhode Island:				
Pawtucket	1-2	...	1-2	Yes
Providence	2	5	3	Yes
Woonsocket	1	1	1	Yes
South Carolina:				
Columbia	2	3	2	Yes
Greenville	2	...	2	Yes
Orangeburg	1	...	1	Yes
South Dakota:				
Lead	1	1	2	Yes
Madison	½	½	...	Yes
Mitchell	1	1	By rail	Yes
Sioux Falls	2	...	1	Yes
Yankton	½	½	½	Yes
Tennessee:				
Clarksville	1½	1½	1	Yes
Dyersburg		None locally available		
Greeneville	8	...	In city	Yes
Jackson	1½	1½	...	Yes
Lebanon	6	6	30	Yes
Memphis	In river		50	Except stone
Murfreesboro	½	¼	½	Yes
Texas:				
Austin	2	2	None used	Partly
Brownwood	2½	2	2	Yes
Clarksville	185	185	100	Yes
Cleburne	18	18	None	Yes
Corpus Christi	80	80	170	No
Greeneville	40	40	80	No
Longview	25	25	...	No
Paris		None locally available		
Port Arthur	46	46	None	Yes
San Angelo	4	3	...	No
Temple	All in city		...	Yes
Waxahachie	1	1	1	Yes
Utah:				
Logan	2	2	2	Yes
Ogden	1	1	1	Yes
Salt Lake City	3	3	3	Yes
Tooele City	½	½	...	Yes
Vermont:				
Burlington	In city limits		...	Yes
Montpelier	1½	1½	1	Yes
St. Albans	2	2	1	Yes
St. Johnsbury	½-¾	½-¾	¾-1¼	No
Virginia:				
Charlottesville	1½	...	...	Yes
Danville	1½	None	...	Yes
Harrisonburg	20	...	1	Yes
Martinsville	4	4	60	Yes
Newport News	Available by rail or water			Yes
Pulaski	2	0.6	0.6	Yes
Suffolk	1½	...	...	...
Winchester	¼	¼	¾	...
Washington:				
Aberdeen	...	...	...	No
Bellingham	1	1	...	Yes
Everett	Water transportation available			
Olympia	½	½	½	Yes
Seattle	1-5	1-5	...	Yes
Spokane	2	2	1	Yes
Tacoma	In city		20	Yes
Walla Walla	In city		...	...
Yakima	2	2	3	Partly
West Virginia:				
Bluefield	Only by rail		1 to 2	Yes
Fairmont	1	By rail	½	Yes
Huntingdon	¼	¼	None used	Yes
Mannington	15	40	At hand	Yes
Moundsville	1½	1½	By rail	Yes
Piedmont	½-1	None	5	Yes
Williamson	¼	Nearby	At street	Yes
Wisconsin:				
Baraboo	1½	...	...	Yes
Beloit	1	1	...	Not good
Eau Claire	½	...	...	No
Edgerton	2	2	...	Yes
Fond du Lac	50	50	15	Yes
Fort Atkinson	1½	1½	...	Yes
Grand Rapids	1	1	60	Yes
Green Bay	2	...	8	Yes
Janesville	¾	¾	¾	Yes
Kenosha	3	Must be shipped in		Yes
Lake Geneva	1/3	1/3	1/3	Yes
Madison	50	50	80	No
Manitowoc	2	2	...	Yes
Marinette	1	None locally		...
Menasha	2	2	1	Yes
Milwaukee	1-3	1-3	1-3	Yes
New London	20	1-20	20	Fair
Oshkosh	Shipped by boat 8 mi.		In city	Yes
Plymouth	All in city limits			
Port Washington	1	1	1	Yes
Two Rivers	2	2	9	Yes
Wauwatosa	All in city limits			Yes
Waukesha	2	2	2	Yes
Waupaca	4	4	Local	Yes
Wausau	1½	1½	1	Yes
West Allis	1½	1½	2	Yes
Whitewater	20	20	20	Yes
Wyoming:				
Cheyenne	¾	¾	None	Yes

CONCRETE PAVEMENTS LAID IN 1917.

State and City.	Yards laid in 1917.	Av. cost per yard.	One or two-course.	Thickness.	Proportions of mix.	Is reinforcement used?	Do you use hydrated lime?	How far apart are expansion joints?
Alabama:								
Gadsden	4,000*	1.55	two	..	1:2½:5	..	..	..
Montgomery	....	..	one	6	1:2:3	No	No	30
Tuscaloosa	....	..	...	..	....	No	No	30
Arkansas:								
Fort Smith	1,200*	1.38	...	..	1:2:3	No	No	40
Little Rock	39,500*	1.50	...	5	1:2:4	..	..	..
California:								
Alameda	....	..	...	..	....	No	No	30
Bakersfield	11,383*	1.33‡	one	4	1:2½:4½	No	No	50
Berkeley	8,000*	1.12½	...	6	1:2½:4½	No	No	20
Los Angeles	53,704*	1.11-1.18	...	5-6	1:2:3½	..	..	50
Oakland	2.0*	1.00	one	4-5	1:2:4	No	No	None
Pasadena	25,505*	.864‡	one	5	1:2:4	No	No	Not used
Petaluma	10,000*	.67	one	..	1:2½:5	No	No	Not used
Pomona	....	..	one	4	1:2:4	No	No	32
Redlands	....	..	...	..	1:2:4	On swampy lands	No	40
Richmond	....	..	one	6	1:2½:5	No	No	..
San Bernardino	34,497*	.774	...	..	1:2½:5	No	Will in future	None
Santa Ana	....	..	one	4	1:3:6	..	..	..
Santa Barbara	3,535*	1.60‡	one	4-5	1:2:3½	No	No	25-30
Santa Monica	....	..	one	4	1:2:4	Some	No	50
Stockton	4,439	..	...	..	....	..	..	..
Colorado:								
Colorado Springs	2,000*	1.50‡	one	6	1:2:4	No	No	50
Fort Collins	17,124†	1.32‡	one	6	1:2:3	Yes	No	35-40
Connecticut:								
Ansonia	....	..	...	..	....	No	No	30
Bristol	....	..	both	8	1:2:3½	Yes	..	20-25
Greenwich	23,350*	1.56	one	5-7	1:2:4	Yes	No	50
Hartford	10,190*	1.49	one	7	1:2:4	Some	No	40
Middletown	8,882*	2.02‡	one	6-8½	1:2:4	Yes	No	30
New Haven	4,182*	..	one	Hassam	1:2:2½	No	No	None
Stamford	2,123*	1.51	one	6	1:2:4	Some	No	20-35
Wallingford	....	..	...	..	....	Some	No	30
Delaware:								
New Castle	....	..	...	..	....	No	No	50
District of Columbia:								
Washington	26.532	0.89	one	..	1:2:4	No	No	End of day's work
Florida:								
Pensacola	....	..	one	6	1:2½:5	No	No	20
Georgia:								
Americus	12,862†	1.13	one	6	1:2:3	Yes	No	36
Athens	11,500†	1.30	two	7	1:3:5 1:2	..	..	40
Savannah	24,427	1.44‡	one	6	1:1½:3	No	..	30
Idaho:								
Lewiston	6,576‡	1.45	one	6	1:2:3	No	No	30
Boise	....	..	...	..	....	No	No	30-50-75
Moscow	....	..	...	..	....	No	..	25-40
Pocatello	....	..	...	..	....	No	No	30
Twin Falls	....	..	one	6	1:2:3	No	No	30
Illinois:								
Alton	....	..	two	8½	1:2½:4 1:1:1⅓	Yes	No	30
Canton	1,344†	1.25	one	..	1:2½:3	No	No	50
Champaign	....	..	...	..	....	Yes	No	30
Chicago	295,299*	1.97	one	7	1:2:3	No	No	35
Chicago Heights	....	..	...	..	....	No	No	50-100
Decatur	....	..	...	..	....	Yes	No	33
De Kalb	....	..	...	..	....	Yes	No	36
Dixon	9,865*	1.285	one	5	1:2:3 1:2½:4	No	No	20-25
E. St. Louis	11,887*	1.79‡	two	4-7¾	1:2½:4 1:1:1½	Yes	No	30
Evanston	....	..	...	..	....	No	Yes	33
Freeport	....	..	...	..	....	No	No	50-100
Gibson City	....	..	...	..	....	No	No	33
Granite	....	..	...	..	....	Yes	..	3
Highwood	7,774*	1.54	one	..	1:2:3	Yes	No	33
Marion	12,650*	1.59	one	8	1:2:3	No	No	35
Moline	570*	1.43	...	..	1:2:3	Yes, if more than 20′ wide	No	20-30
Oak Park	7,390*	1.76	one	6	1:2:3	No	No	33
Peoria	15,000*	1.40	one	6	1:2:3	Yes	No	40
Pontiac	3,069	1.71	one	7⅓	1:2:3	Yes	No	36
Springfield	....	..	...	..	....	No	No	40
Taylorville	....	..	...	..	....	Yes	No	24
Waukegan	25,100*	1.82	two	7	1:2¼:4 1:1½:2	Yes	No	30
Indiana:								
Anderson	14,000*	2.00	one	6-8	1:2:3	Yes	No	25
E. Chicago	51,504	2.82‡	both	7-8	1:2:3	Yes	No	30
Fort Wayne	4,100*	1.67	two	7	1:2:4 1:1	Yes	No	..
Frankfort	....	..	...	..	....	Yes	No	25
Gary	42,900*	2.00**	one	7	1:2:3	No	No	30
Hartford City	....	..	...	..	....	No	No	50
Indianapolis	¾*	2.20	two	8	1:2½:4 1:2	Yes	..	35
Kendallville	....	..	two	6-8	1:2½:4 1:1½	Yes	No	40
New Albany	14,909	..	one	7-8	1:2:4	Yes	No	33⅓
Noblesville	32,267	1.20	one	6-8	1:2:3	Yes	No	25-30
Peru	....	..	...	..	1:2:4	Yes	No	35
Portland	....	..	...	..	....	Yes	Yes	25
Richmond	530*	1.16‡	one	6	1:2:3	Yes	No	30-35
Seymour	36,000*	1.50	one	6-8	1:2:3	Yes	No	36
South Bend	4,489	1.41	one	7	1:2:3	No	No	25
Terre Haute	....	..	one	..	1:6	Yes	will in future	100
Iowa:								
Algona	1,050	1.54¶	one	6	1:2:4	Yes	No	25
Atlantic	....	..	...	..	....	No	..	25
Burlington	102,699*	1.47‡-2.86§	one and two	5 + 2 = 7	1:2:3	No	No	30
Cedar Falls	484*	1.45‡	one	6	....	No	No	25
Cedar Rapids	3,000	1.34	two	5 + 2	1:3:5 1:2	No	No	32

CONCRETE PAVEMENTS LAID IN 1917 (Continued).

State and City.	Yards laid in 1917.	Av. cost per yard.	One or two-course.	Thickness.	Proportions of mix.	Is reinforcement used?	Do you use hydrated lime?	How far apart are expansion joints?
Iowa (continued).								
Creston	....	..	...	..	....	Partly	No	25
Davenport	10,568*	1.40	one	6	1:2:4	No	No	20
Denison	9,000*	1.475	one	7	1:2:3	No	No	35
Dubuque	....	..	...	..	....	Some	No	20-25
Fairfield	....	..	...	..	....	No	No	10
Fayette	....	..	...	..	....	No	No	25
Ft. Dodge	....	..	...	..	....	No	No	30-50
Glenwood	2,700*	1.81‡	one	..	1:2:4	Over ditches	No	35
Iowa City	3,334*	1.37-1.77	ono	7	1:2:4	Not yet	Not yet	30
Marshalltown	5.92*	1.57	one	6	1:2:3	No	No	25
Mason City	4,000*	1.63	two	6	1:2½:4 1:1:1½	Yes	..	..
Monticello	....	..	...	..	....	No	..	20
New Hampton	....	..	two	2 + 5	1:2:4 1:2	No	..	33
Perry	....	..	...	..	....	Yes	No	25
Sioux City	85,000*	1.80 1.45	one	8 6	1:2½:4½	No	No	50
Kansas:								
Arkansas City	630*	1.10††	one	6-7	1:2:4	No	No	40
Atchison	3,500*	1.42	two	6	1:2:3 1:2½:5	No	No	30
Columbus	580	1.20	one	6	1:2:4	No	No	25
Council Grove	1,600*	1.91	one	8	1:2:3	Yes	No	30
Emporia	.17*	1.54	one	6	1:1½-3	Yes	No	30
Girard	....	..	...	..	....	No	No	30
Gypsum	18,568*	1.58†	one	6½	1:6	No	No	30
Independence	2,000*	1.25	two	4 + 2 = 6	1:2:4 1:2:3	No	No	30
Iola	....	..	...	..	....	No	No	30
Kansas City	58,884	1.275	one	6	....	No	No	50
Leavenworth	....	..	...	..	....	Yes	No	20
Manhattan	668*	1.35	one	6-8	1:2:3	..	Yes	30
Ottawa	1,733*	1.48	one	6	1:2:3	No	No	50
Parsons	....	..	...	..	....	No	No	30
Pittsburg	....	..	...	..	....	No	Yes	30
Rosedale	13,460*	1.10	one	6	1:2:4	No	No	25-28
Salina	.20*	1.53	one	6	1:2:3	No	No	25
Kentucky:								
Louisville	1,917*	1.30	one	5-7	1:1½:3	Over 18 ft.	No	30
Ludlow	....	..	...	..	....	Yes	No	30
Louisiana:								
Lake Charles	24,000*	1.80	6-inch	Vibrolithic	1:2:4	Some	No	30
Shreveport	....	..	one	5	1:3:5	No	No	50
Maine:								
Augusta	2,600*	1.65††	Hassam	..	....	No	No	..
Portland	6,326*	1.97	6-in. Hassam	..	....	No	No	..
So. Portland	7,800†	1.53	one	6	1:2:4	No	No	25
Maryland:								
Cumberland	19,547*	..	one	6	1:2:4	No	No	30
Frederick	....	..	...	..	....	No	No	50
Massachusetts:								
Adams	3,000*	..	two	7	1:2:4	Yes	No	35
Arlington	2,240	2.45	one	8	1:2:4	Yes	No	50
Brockton	8,276*	2.60††	...	..	6-in. Hassam	No	No	..
Lowell	....	..	...	..	....	No	No	..
Lynn	24,976†	1.75	one	6	1:2:4	No	No	..
New Bedford	450†	..	one	8	1:3:5	..	No	30
North Adams	....	..	...	..	....	No	No	36
Northampton	7,260* 3,540†	1.25‡ 1.10‡	one	6	1:2:4	No	No	30
Norwood	1,600*	2.00‡	one	6	....	No	No	End day's work
Peabody	16,500*	2.17‡	...	..	6-in. Hassam	No	No	..
Westfield	500†	..	one	5-7	1:2:3	No	No	25
Worcester	265†	1.60	one	6	1:2¼:4½	No	No	None used
Michigan:								
Adrian	....	..	...	..	....	No	No	30
Alpena	6,851†	1.92††	two	8	....	Some	..	25-40
Ann Arbor	....	..	...	..	....	..	..	30
Bay City	....	..	...	..	....	No	No	30
Cadillac	1.475†	.84	one	7	1:4‡‡	No	No	End day's wk.
Detroit	161,556*	1.90	one	6	1:2:3	No	No	30
Dowagiac	....	..	...	..	....	No	No	30
Grand Haven	20,000†	1.20††	...	6	....	No	No	30
Grand Rapids	2,284*	1.38	one	7	1:4	Yes	No	50
Holland	....	..	...	..	....	No	No	50
Lansing	....	..	...	..	....	No	No	30
Port Huron	1,200†	1.60‡	two	6-8	1:2:3½	On clay	Yes	20
Sturgis	2,000*	1.60	one	5-7	1:4	No	No	20
Three Rivers	....	..	...	..	....	No	No	30
Minnesota:								
Brainerd	28,609*	1,687	one	6	1:3‡‡	No	No	30
Mankato	730*	1.35‡	one	6	1:2:3½	Yes	No	30
Minneapolis	16,700†	..	one	7	1:2:4	No	No	..
St. Paul	4.400	1:75‡	one	7	1:2:4	No	No	25
Stillwater	....	..	...	..	....	Yes	No	25-35
Mississippi:								
Jackson	....	..	...	..	....	No	No	30-50
Vicksburg	....	..	one	4	1:3:5	No	No	100
Missouri:								
Bethany	7,550*	1.44‡	one	6	1:2:4	No	No	25
Boonville	....	..	...	..	....	No	No	25
Brookfield	....	..	...	..	....	No	No	30
Cape Girardeau	21,101*	1.14	one	6	1:1½:3	Yes	No	50
Carthage	68,766*	1,295	one	6	....	Yes	No	40
Excelsior Springs	....	..	...	..	....	No	No	30-40
Independence	....	..	...	..	....	No	No	25-30
Joplin	59,060*	1.40‡	two	..	1:4½ 1:1½	Yes	No	20-50

CONCRETE PAVEMENTS LAID IN 1917 (Continued).

State and City.	Yards laid in 1917.	Av. cost per yard.	One or two-course.	Thickness.	Proportions of mix.	Is ment used? reinforce-	Do you use lime? hydrated	How far apart sion joints? are expan-
Kansas City	326,160	1.40	one	7	1:2:3½	No	No	None
Sedalia	10,200*	1.45‡	one	6	1:2:3	No	No	36
Springfield	....	..	...	..	....	More than 27' wide	No	33
Webb City	....	..	one	7	1:1:4	No	No	25
Montana:								
Billings	3,027*	1.84	one	6	1:2:4	Yes	No	25
Bozeman	1,200*	2.80	one	6	1:1½:3	No	No	25
Great Falls	8,550*	1.42	one	6	1:2:4	No	No	35
Helena	27,300*	1.70	one	6-8	1:1½:3	Yes	..	33
Nebraska:								
Hastings	1,000	1.85	two	6	1:4‡‡ 1:3 top	No	No	25
Lincoln	2,338*	1.47‡	one	6	1:2½:4	No	No	40
Omaha	15,568*	1.43	one	6	1:2:4	No	No	30
New Hampshire:								
Nashua	1,000†	1.25	one	..	1:1½:3	No	No	50
New Jersey:								
Camden	.036	..	one	6	1:2½:5	..	..	..
Irvington	14,215	1.75	...	6	1:2:3	Some	No	33⅓
Millville	....	..	one	7	1:2:3	Yes	No	..
Montclair	3,950*	1.52	one	7	1:2:3	Yes	No	30
New Brunswick	6,600*	1.95‡	one	7	1:2:3	No	No	36
Newton	5,700*	.55	one	..	1:2:3	Yes	No	36
Plainfield	29,000*	1.85‡	one	6-8	1:1½:3	Yes	..	50
Rahway	4,311†	1.06	one	6	....	Yes	..	..
Red Bank	3,237†	2.50	one	6-8	1:1½:3	Yes	No	25-30
Ridgewood	4,000*	2.16	one	7⅓	1:2:4	Yes	No	30
Westfield	....	..	one	6-8	1:1¾:3	Yes	No	50
New York:								
Amsterdam	3,000*	2.00‡	one	7	1:2:3	Yes	No	33
Binghamton	9,000*	1.66‡	one	7	1:2:3	Yes	No	36
Buffalo	....	..	...	..	....	No	No	50
Corning	....	..	...	..	....	Yes	No	25
Fulton	....	..	one	6	1:1½:3	Yes	No	30
Geneva	....	..	...	..	....	Yes	No	30
Glens Falls	....	..	...	..	....	Yes	No	30
Gloversville	....	..	...	..	....	Yes	No	35
Haverstraw	....	..	...	..	....	No	No	30-200
Herkimer	....	..	...	..	....	Yes	..	30
Lancaster	....	..	...	..	1:1½:3	..	..	..
Little Falls	2,708*	2.76†† 1.60	one	5-7½	1:1½:3	No	No	30
Mamaroneck	....	..	...	..	....	No	No	25
New York:								
Manhattan Borough	9,902*	2.42	two	9-5	1:2:3	Yes	No	50
Richmond Borough	12,458*	1.53	one	6	1:2:4	No	No	35
Niagara Falls	3,390*	2.76††	one	8	1:2:3	No	No	30
North Tonawanda	....	..	...	..	....	Yes	No	30
Oneida	3,210*	1.73‡	one	6	1:2:4	No	No	33
Schenectady	980*	1.10‡	one	6	....	No	No	30
White Plains	3,109*	2.42‡	one	6-9	1:2:3	No	No	30
North Carolina:								
Asheville	18,296* 17,696†	1.30‡ 1.15‡	one	6-7	1:2:4	No	No	25-30
Greensboro	7,675†	1.07‡	one	6	1:2:4	No	No	50
New Bern	....	..	...	..	....	No	No	50
Salisbury	12,000*	1.39	one	6	1:2:3	No	Some	30
Winston-Salem	....	..	...	..	1:2:3	Yes	No	33⅓
North Dakota:								
Bismarck	....	..	two	2 + 5	....	Yes	No	35
Fargo	....	..	...	..	....	Yes	No	30
Grand Forks	10,480	1.59	one	6-8	1:2:3	Yes	..	..
Ohio:								
Bellefontaine	4,260*	1.38	one	..	1:2:3	Yes	No	50
Cincinnati	4,057*	2.07	one	7	1:1½:3	Most streets	No	30
Cleveland	1.05*	2.25	two	6-8	1:1½:3 1:2½:5	Yes	..	100
Delaware	....	..	...	..	....	Yes	No	100
East Liverpool	7,157*	1.70‡	one	6	1:1½:3	More than 20' wide	No	36
Findlay	....	..	...	..	....	No	No	30
Fostoria	5,945	1.52	one	6	1:2:3	Yes	No	60-100
Greenville	....	..	...	..	1:1½:3	Yes	No	33⅓
Hamilton	....	..	...	..	....	Yes	No	30
Ironton	....	..	...	..	....	Yes	No	30
Lakewood	10,170*	2.80	two	7	1:2½:4 1:1½:2	Yes	No	36-50
Marietta	5,851*	1.42‡	one	6	1:2:4	No	No	25
Marion	....	..	...	..	....	Yes	Yes	100
Middletown	6,278*	1.98‡	...	..	1:2:3	Yes	No	60
Painesville	2,098	1.89††	two	5-7	1:2½:5 1:1½:3	Yes	No	30
Port Clinton	583*	1.70	one	6-8	1:1½:3	Yes	No	40
St. Bernard	300	1.00	one	6	1:2½:5	No	Will	30
Sandusky	15,900*	.34-1.90	two	5-8	....	Yes	No	50
Toledo	4,912*	2.27	one	6-8	1:2:3	Yes	No	36
Urbana	....	..	...	..	....	No	No	25
Van Wert	....	..	...	..	....	Yes	No	30
Wapakoneta	....	..	...	..	....	..	..	30-60
Youngstown	....	..	...	..	....	Yes	No	30
Zanesville	4,680*	2.10	one	6-8	1:1½:3	Yes	No	30
Oklahoma:								
Bartlesville	18,400*	1.28	one	6-8	....	No	..	30
McAlester	1,617*	1.50	one	6	1:1½:3½	No	No	35
Wagoner	....	..	...	..	....	Yes	..	50
Oregon:								
Corvallis	....	..	one	6	1:4½	Yes	No	30
Newberg	972*	1.62	one	5½-6½	1:1½:3	No	..	30
North Bend	14,300*	1.28	one	6	1:2:3	On poor base	No	36
Salem	6,223†	1.10	one	6	1:2:4	No	No	50
West Linn	4,000*	1.39	one	6	1:2:4	No	No	24
Pennsylvania:								
Beaver Falls	....	..	...	..	....	No	No	32
Carlisle	232†	1.94‡	...	..	1:3:4	Yes	No	40
Franklin	275†	1.98††	one	6	1:2:2½	No	No	25
Freeland	1.0*	1.90	two	8	1:3:5	Yes	No	10-16

CONCRETE PAVEMENTS LAID IN 1917 (Continued).

State and City.	Yards laid in 1917.	Av. cost per yard.	One or two-course.	Thickness.	Proportions of mix.	Is reinforcement used?	Do you use hydrated lime?	How far apart are expansion joints?
Hazleton	3,705* 416†	1.75‡ .70‡	one	5	1:2:4	..	..	....
Johnstown	2,486*	2.03‡	one	6	1:2:3	Yes	No	24
Lebanon	1,600	2.26‡	one	6	1:1½:3	Yes	No	30
McKeesport	....	..	one	..	1:2½:5	..	..	..
Philadelphia	1,564*	1.683	...	..	1:2:4	No	No	30
Pittsburgh	9,365* 2,110*	1.90 1.85	one	6-8	1:2:3	No	No	30
Reading	....	..	...	..	....	No	No	25-40
Sayre	4,800*	1.72	one	6	1:2:3	Yes	No	30
Shamokin	....	..	...	..	....	No	No	40
Wilkinsburg	1,141*	3.10§§	one	7	1:2:3	No	No	15′ on 15′ rds.
Rhode Island:								
Woonsocket	1,900*	..	one	6	1:2:4	No	..	30
South Carolina:								
Greenwich	3,000*	1.35‡	one	7	1:2:3	No	No	35
South Dakota:								
Lead	307*	2.93	one	6	1:2:4	Yes	No	35
Mitchell	250*	1.807	two	..	1:3:5 1:1:1	Yes	No	30
Sioux Falls	10,679*	1.75‡	one	6-7	....	No	No	35
Yankton	26,000*	1.38	one	6	1:2:3	Over 30 ft.	No	30
Tennessee:								
Clarksville	....	..	...	..	....	No	No	25
Dyersburg	500	1.40‡	one	6	1:2:3	No	No	36
Lebanon	....	..	...	...	....	No	No	30
Memphis	981*	1.38	one	6	1:5	No	No	35
Murfreesboro	....	..	...	..	....	No	No	25
Texas:								
Austin	1,868*	1.65‡	two	..	1:6 1:2	No	No	25
Clarksville	....	..	one	4	2:3:4	Yes	Yes	30
Greenville	....	..	...	..	....	No	Yes, 5%	33
Port Arthur	....	..	...	..	....	Yes	No	32
Temple	600	1.21	two	4+2=6	1:6 1:4	No	No	25
Waxahachie	....	..	...	..	....	..	..	30
Utah:								
Logan	21,000*	2.00	one	7	1:2:4	Yes	No	40-60
Ogden	30,852*	1.65	two	6	....	Yes	No	40-50
Salt Lake City	45,675	1.20	one	6-8	1:2:3	Some	No	30-50
Virginia:								
Charlottesville	4,633*	1.79	one	5-7	1:1¾:3	No	No	50
Danville	....	..	...	..	....	No	No	30
Martinsville	130	1.50	two	5	1:3:5 1:2	No	No	30
Newport News	20,305	3.64	two	7-9½	1:3:6 1:1½:3	No	..	..
Suffolk	11,000†	1.30	one	..	1:1½:3	No	No	35
Washington:								
Aberdeen	670* 972*	1.79 1.50	one	8 6	1:2:3	No	No	30
Bellingham	12,138*	1.34	one	6-8	1:2:3	No	No	30
Everett	29,529*	1.325	one	6	1:2:3	No	No	30
Olympia	....	..	one	7	1:2:3	..	..	..
Seattle	1.46*	1.60	one two	5 6	1:2½:4 1:3:6 1:1½:1	No	No	30
Spokane	....	..	...	..	....	No	..	30
Tacoma	1.383*	1.50	two	..	1:3:6 1:1:1	No	No	25
Walla Walla	....	..	...	..	....	No	No	30
Yakima	....	..	...	..	....	No	No	25
West Virginia:								
Fairmont	800†	2.00	one	5	1:2:4	Over 20′ wide	No	35-40
Huntingdon	....	..	...	..	....	No	No	30
Moundsville	....	..	...	..	....	..	..	25
Piedmont	705*	1.35	one	..	1:2:4	No	No	50 or less
Wisconsin:								
Eau Claire	27,882†	1.78	one	7	1:2:3½	Yes	No	30
Edgerton	19,000*	1.59	one	5½+8½	1:2:3	Yes	No	25
Fond du Lac	17,914* 1,201†	1.69‡	two two	5-8	1:2½:5 1:1:1	Yes	No	50
Ft. Atkinson	12,400*	2.00	one	7	1:2:3½	Yes	No	35
Grand Rapids	3*	1.52	two	..	1:2½-3½	Yes	No	35
Green Bay	3.300	2.10	two	6+2=8	1:2½:4 1:1½:2½	Yes	No	30
Janesville	....	..	...	..	....	Yes	No	33
Kenosha	....	..	two	5+2=7	1:2:4 1:1:1½	Will	No	40
Lake Geneva	....	..	...	..	....	Yes	No	35
Madison	2.56*	1.65	two	..	1:2½:4 1:1½:2½	Yes	No	30
Marinette	11,876*	1.70	two	..	1:2½:5 1:1: 1½	Yes	No	42
Menasha	3.000*	1.85	two	7	1:2½:4	Yes	No	35
Milwaukee	28,233*	1.36	one	6	1:2½:4	No	No	50
New London	....	..	...	..	....	Yes	No	25-35
Oshkosh	....	..	...	..	....	Yes	Yes	50
Plymouth	½	1.70‡	two	7	....	Yes	No	25
Wausau	5.300*	1.85‡	two	5+2½=7½	1:2:3 1:1:2	Yes	Yes	30
Wauwatosa	734*	1.95**	two	7	1:2½:5 1:2	Yes	No	30
West Allis	....	..	one	6-8	1:2:3½	Yes	No	30-50
Whitewater	11,450*	1.52	one	7	1:2:3½	Yes	No	35

Footnotes—*By contract; †by municipality; ‡includes grading; §between car tracks; **includes curbs only; ††includes grading, curbs, engineering, walks (everything); ‡‡gravel concrete; §§includes all but grading; ¶includes grading from grade to subgrade.

GRANITE AND STONE BLOCK PAVEMENTS.

City and State.	Yards Laid in 1917.	Aver. Cost per sq. yd.	Kind of Filler.	Base Kind.	Base Thickness.
California:					
San Fran	16,261*	$3.22[6]	....	conc.	6
Connecticut:					
Greenwich	623*	5.00[6]	pitch	conc.	6
Hartford	3,050*	4.03§	grout	conc.	6
New Haven......	4,674*	4.46**	gravel pitch	conc.	6
District of Columbia:					
Washington	12,294	2.84§	....	conc.	6
Georgia:					
Savannah	1,851	2.57[6]	....	....	2
Illinois:					
Chicago	78,073*	4.99§	pitch & gravel	conc.	6
Indiana:					
Indianapolis	0.10*	3.11[4]	sarco	conc.	6
Kentucky:					
Louisville	4,359† 2,132†	4.06§	grout	conc.	6
Maine:					
Augusta	1,986**	3.003††	grout	Hassam	4
Lewiston	4,000†	....	grout	conc.	....
Portland	3,861*†	2.42[1][6] 2.59[2][6]	grout	conc.	4
Rockland	1,659†	2.583‡	grout	....	....
Massachusetts:					
Brockton	4,731	3.50§ 1.80	grout on old base	conc.	4
Cambridge	7,031†	2.60[4]	grout	conc.	6
Haverhill	2,190†	2.85‡	grout	laid on old base	....
Lawrence	5,249†	....	grout	....	....
Lowell	16,787†	....	grout	conc.	6
Lynn	3,100†	3.50	grout	rolled subgrade	....
New Bedford.....	13,500*	4.25[6]	grout	conc.	4
No. Adams.......	322*	.44	grout	laid on old base	....
Revere	1,250†	4.10††	....	conc.	6
Somerville	10,718*	2.52††* 3.80[6]	grout	conc.	5
Woburn	10,255*	3.60[6]	grout	conc.	5
Worcester	15,180†	3.40[6]	grout	conc.	5
Michigan:					
Detroit	1,230*	4.48§	grout	conc.	6-8
Missouri:					
Kansas City......	2,540	4.20§	grout	conc.	8
Nebraska:					
Omaha	22,827*	2.04[4]	grout	conc.	6
New Hampshire:					
Laconia	389†	1.00	....	no base	....
Nashua	1,500†	.65	grout	....	....
New Jersey:					
Bayonne	18,900*	3.90§	grout	conc.	6
Camden	323*	2.90§	grout	conc.	6-8
Elizabeth	1.3*	3.76[6]	grout	conc.	6
Newark	24,859*	3.45[6]	grout	conc.	6
Plainfield	6,400*	Laid by Ry. Co.	grout	conc.	6
West New York..	3,115*	2.92[6]	....	conc.	5
New York:					
Albany	1,130* 370* 12,570* 5,630* 800*	3.75§ 3.90 2.20†† 2.20†† 2.20	grout laid in car tracks grout laid in car tracks old block	conc. conc. conc. conc. conc.	6 6 6 6 6
Amsterdam	5,500* 2,000*	3.95§ 2.99††§	pitch grout	conc. conc.	6 6
Buffalo	10,113*	5.59††	grout	conc.	6
New York:					
Bronx	2,515* 14,500*	1.44§ 3.01§	sand bit. & grout	conc.	6
Brooklyn	97,180*	4.194§	tar, asph. & sand	conc.	6
Manhattan	137,233*	4.22‡	a.-cem.	conc.	6
Queens	36,149*	....	grout, tar & gravel	conc.	6
Richmond	6,894*	4.38	grout	conc.	6
Oswego	3,294*	4.55††	grout	conc.	6
Syracuse	165*	3.40§	grout	conc.	6
North Carolina:					
Winston-Salem ..	12,447*	2.50‡[3] 1.50‡	.... grout	conc.[3] sand	5[3] 3
Ohio:					
Ashtabula	1,930*	3.86§	grout	conc.	6
Cincinnati	12,354*	3.61§	pitch grout	conc.	3-8
Cleveland	1.39*	4.68§	....	conc.	6
Norwood	16,550*	4.70§	cement mastic	conc.	6
Oregon:					
Corvallis	4,083	....	Belgian block laid by St. Ry. Co.		
Pennsylvania:					
McKeesport	640*	1.54§	Old blocks laid on slag and gravel base		
Philadelphia	2,118*	4.23§	....	conc.	6
Pittsburgh	27,501* 14,636*	4.00§ 3.60§[4]	grout	conc.	6
Scranton	2,244*	1.60§[5]	grout	conc.	6
Wilkes-Barre	232	4.50‡	....	conc.	6
Rhode Island:					
Pawtucket	5,850*	4.47§	....	conc.	6
Providence	12,837†	....	grout	....	....
Woonsocket	20,000*	3.96§	....	....	5
Tennessee:					
Memphis	3,638*	.77	grout	old base	....
Virginia:					
Danville	1,700†	2.45[6]	pitch	conc.	6
Wisconsin:					
Milwaukee	19,274*	3.62§	grout	conc.	6

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* By contract; † by municipality; ‡ includes grading; § includes base; [6] includes base and grading; ** includes curb and grading; †† includes completed pavement; ‡‡ recut blocks; [1] large blocks; [2] split blocks; [3] Durax; [4] repaving; [5] old blocks furnished city free.

BRICK PAVEMENTS.

City and State.	Yards Laid in 1917.	Av. Cost Per Yard.	Depth of Cushion.	Kind of Filler.	Kind of Base.	Thickness of Base.	Cost of Base.
Alabama:							
Gadsden.	550*	....	...	....	....	...	....
Troy.	30,000	$2.19§	1	grout	conc.	3½	....
California:							
Berkeley	1,650*	3.43[6] [1]	monolithic	....	conc.	4	....
San Francisco....	57,356*	3.25[6]	2	grout	conc.	4	....
Delaware:							
Wilmington	31,300*	2.75[6]	1	grout	conc.	5	....
Florida:							
Palatka	12,544*	1.53	...	grout	sand	...	....
St. Petersburg...	7	1.43§	...	....	sand	...	....
Sanford.	17,000*	1.58‡	...	....	sand	...	....
Illinois:							
Alton.	48,300	1.68§	...	....	conc.	4	....
Aurora	4,400*	1.93[6]	...	....	conc.	5	....
Bloomington..	38,162* 5,963*	2.30[6] 2.02[6]	2	grout and asphalt	conc.	6 4	....
Minnesota:							
Minneapolis.	2,700†	....	1	pitch	conc.	5	....
St. Paul	9,500	2.50[6]	...	....	....	5	....
Mississippi:							
Laurel.	1,018*	1.55§	1	sand	earth	...	....
Vicksburg.	885	1.75§	1½	grout	....	...	....
Missouri:							
Bethany.	1,250*	1.65§	...	....	conc.	4	....
Excelsior Spgs...	600*	2.24[6]	1	asphalt	conc.	4	....
Joplin	23,800*	1.75[6]	1	asphalt	conc.	6	.83
Kansas City......	38,735	2.64§	½	asphalt	conc.	6-8	....
Sedalia	5,500*	2.03[6]	1½	asphalt	conc.	4	....
Springfield	339*	2.575[6]	1	grout	conc.	5	....
Montana:							
Billings.	295*	6.00	car track construction			...	....
Helena.	1,600*	2.65§	...	grout	conc.	5	....

Champaign.	34,222	1.72§–1.92§	1½	grout and asphalt	conc.	4, 5, 6	....
Chicago	447,094*	2.76§	1	asphalt	conc.	6	....
Chicago Heights.	35,800*	2.20**	2	grout	conc.	6	....
Decatur.	16,355*	1.99§	1	grout	conc.	6	....
East St. Louis...	37,675*	2.00[6]	monolithic	....	conc.	5-7	....
Evanston.	49,652*	1.95§ 1.33	2 2	sand grout	asphalt macadam	5	$0.22
Flora.	18,086	1.62§	1	grout	conc.	4	....
Freeport.	3,000*	1.90§	1	grout	conc.	4	....
Gibson City	18,000*	2.21**	1	grout	conc.	4	....
Gillespie.	13,900	1.84§	monolithic	....	conc.	4	....
Granite.	12,250	2.05§	monolithic	....	conc.	4	....
Marion.	48,000	1.62§	1	grout	....	...	....
Oak Park	8,620*	2.95§	1	grout	conc.	6	....
Pekin	34,145*	1.705[6]	1½	grout	conc.	4	....
Peoria.	24,646*	2.00§	1	grout	conc.	5	....
Pontiac.	21,327	1.87§	none	grout	conc.	3¼	....
Springfield.	2.61*	1.75§	1	grout	conc.	5	....
Sterling	32,677* 9,498*	2.01** 2.11**	2	pitch	conc.	4 6	....
Streator.	18,000*	2.15**	1	grout	conc.	4	....
Waukegan	9,200*	2.12§	1	grout	conc.	5	....
Indiana:							
Anderson.	8,000*	2.30§	none	grout	conc.	6	....
Crawfordsville.	16,147*	1.247**	1½	grout	conc.	6	....
Fort Wayne	9,413*	2.00§	2	grout	conc.	6	....
Frankfort.	8,636*	1.97§	1	grout	conc.	4	....
Indianapolis	3.67*	3.16[6]	2	grout	conc.	6	....
Madison	8,000*	2.25[6]	1½	grout	conc.	5	....
Marion	5,043*	2.25**	...	sand	stone and gravel	10	....
New Albany	14,056	....	1½	asphaltic	....	...	....
Richmond	5,360*	2.16[6]	none	grout	conc.	5	....
South Bend	7,107*	2.40§[2]	1	grout	conc.	7	....
Terre Haute	1,671*	2.30§	4	grout	conc.	4	....
Iowa:							
Burlington	10,352*	2.07[6]	1½	sand-pitch	conc.	6	....
Cedar Rapids	26,200	2.27§	1½	asphalt	conc.	6	....
Davenport.	23,565*	2.00§	2	pitch	conc.	5	....
Dubuque.	33,371*	2.25§	...	asphalt	conc.	5	....
Glenwood	32,000*	2.38[6]	1½	asphalt	conc.	4	....
Iowa City	17,983*	1.98§-2.54§	1½	asphalt	conc.	5	....
Muscatine.	1,560†	1.80**	...	....	sand	6	....
Kansas:							
Arkansas City	15,671*	1.81**	1½	asphalt	conc.	4	....
Beloit	60,893*	2.16[3]-2.28[4]	1	asphalt	conc.	5	....
Cherryvale	14,000*	2.14**	...	....	cinder	6	....
Columbus.	12,668*	1.78§	...	....	conc.	4	....
Council Grove	46,600*	1.90§	2	asphalt	....	5	....
Fort Scott	8,400*	1.65 1.85 2.33	 1½	grout asphalt	conc. conc.	4 5	....
Independence	25,200*	1.45 2.15	1½	asphalt	macadam conc.	6 4	....
Kansas City	5,019	1.625†	1½	asphalt	old base	...	....
Neodesha.	28,200*	1.76§	4	asphalt	conc.	4	....
Ottawa.	4,000*	1.57§	2	asphalt	conc.	4	....
Parsons	26,240*	1.76-3.00[2]	2	asphalt	....	4-5	....
Pittsburg	4,251	1.83§	1½	asphalt	conc.	4	....
Pratt.	90,000*	2.11§	1½	asphalt	conc.	5	....
Salina.	3.3*	1.90§–2.02§	1½	asphalt	....	4-5	....
Topeka.	7,700*	2.18§	1	asphalt	conc.	5	....
Kentucky:							
Louisville.	21,034† 50,507*	1.75§	1	grout	conc.	6	....
Maysville.	25,000*	1.21	1½	tar	conc.	6	.85
Louisiana:							
Lake Charles	10,500*	2.25§	1½	grout	conc.	5	....
Maryland:							
Cumberland.	10,883*	....	1	grout	conc.	4	....
Massachusetts:							
No. Adams	3,675	.49	1	grout	old 6-inch base		....
Somerville	1,658*	2.97[6]	1	grout	conc.	4	....
Michigan:							
Ann Arbor	2,666*	1.50	...	grout	conc.	5	.97
Battle Creek	9,625†	2.15[6]	1½	grout	conc.	6	....
Detroit.	23,005*	2.98§	1	sand	conc.	6-8	....
Flint.	23,000	1.30‡	...	grout	conc.	6	.80
Grand Rapids	18,616*	1.55 1.64	1½	grout	conc.	5	.73
Kalamazoo.	14,185†	2.43§	1½	asphalt	conc.	6	....
Nebraska:							
Lincoln.	30,836*	1.78[6] 2.39[6]	... 2	grout asphalt	conc. conc.	3 5	....
Omaha	374,411*	2.50§	1½	bit.	conc.	6	....
Red Cloud	14,875	2.58[6]	2	asphalt	conc.	5	....
New Jersey:							
Atlantic City	6,009*	1.78	1½	grout	conc.	6	.90
Newark	1,207*	2.78[6]	1½	grout	conc.	6	....
Plainfield	22,000*	2.75[6]	1	grout	conc.	6	....
New York:							
Albany.	9,000	2.50§	1½	grout	conc.	6	....
Amsterdam	1,500*	2.54[6]	1	grout	conc.	6	....
Auburn.	11,293	2.01‡	1	grout	old base used		....
Binghamton	9,905*	2.44[6]	½	grout	conc.	5	....
Buffalo	39,449*	3.64**	1½	grout	conc.	6	....
Elmira	9,602	2.66[6]	1½	pitch	conc.	5	....
Jamestown	15,263†	2.39[6]	1½	grout	conc.	5	....
New York: Richmond	6,546	2.40	⅝	grout	conc.	6	1.05
Niagara Falls	9,862*	3.37[6]	1	grout	conc.	6	....
No. Tonawanda	14,000	2.88§	1½	grout	conc.	5	....
Olean.	19,550*	1.49	1½	grout	conc.	5	.90
Oswego.	6,058	3.15[5]	1	grout	....	6	....
Rensselaer.	4,472*	2.28§	2	sand	....	6	....
Syracuse.	10,414*	2.38§	1½	grout	conc.	6	....
White Plains	1,070*	3.90[6]	1	....	conc.	6	....
North Carolina:							
New Bern	2,500†	1.70*	2	sand	earth	...	....
North Dakota:							
Fargo.	6,050*	2.50[2]	1	asphalt	conc.	7	1.75
Ohio:							
Bellefontaine.	420*	1.95§	1	grout	conc.	6	....
Bucyrus.	25,900*	2.30**	1½	grout	conc.	5	....
Cincinnati.	10,419*	2.76§	1	grout	conc.	6	....
Cleveland	235,629*	1.80	1	grout	conc.	5, 6 & 7	1.08
Coshocton.	15,713	1.72§	...	....	sand and gravel	...	..
Defiance	2,000	2.25§	...	....	conc.	6	....
Delaware	3,700*	1.71§	2	grout	conc.	6	....
E. Liverpool	10,804*	2.22[6]	...	....	....	...	....
Findlay	3,079	2.13§	1	sand	conc.	6	....
Fostoria	12,000	2.80§	1	grout	conc.	5	....
Fremont	25,330*	1.99§	1½	sand	conc.	5	....
Greenville	17,396*	1.50‡ 2.455[6]	1 1	....	old base conc.	... 6	....
Lancaster	4,488*	.90§	...	sand	gravel	8	....
Lima	33,366*	2.40§	1½	grout	conc.	6	....
Logan	8,000	....	2	grout	....	...	....
Lorain	300*	....	1	grout	conc.	6	....
Marietta	18,180*	1.51‡	2	sand	....	...	....
Marion	12,000*	1.50	1	....	conc.	6	.90
Newark	2,873	2.12[6]	1	grout	....	4	....
Norwood	20,100*	2.00§	1	grout	conc.	6	....
Piqua	48,000*	1.79§ 2.20§	...	....	conc.	6	....
Port Clinton	1*	2.60§	1½	mastic	conc.	6	.80
St. Bernard	16,500*	1.75‡	½	grout	conc.	6	1.08
Sandusky	3,200*	1.84	monolithic	....	....	...	....
Springfield	18,000*	2.35§	1	grout	conc.	6	....
Steubenville	5,400*	2.62§	1½	grout	conc.	4	....
Toledo	33,393*	1.50-1.75	1	mastic	conc.	6	.90
Washington	14,600*	1.90§	1½	grout	conc.	6	....
Westerville	4,000†	1.90§	...	....	conc.	4	....
Xenia	3,850*	2.60[6]	1	grout	conc.	6	....
Youngstown	58,995*	1.90§	...	....	conc.	5-6	....
Zanesville	5,650*	2.47§	1½	grout	conc.	6	....
Oklahoma:							
Elk City	2½	2.15§	...	....	....	...	....
Pennsylvania:							
Beaver Falls	18,200*	1.65[6]	2	tar	gravel	...	....
Bradford	17,068*	2.67§	...	....	conc.	5-6	....
Carlisle	7,606†	2.11[6]	...	....	conc.	5	....
Charleroi	1,400*	2.31§	...	....	slag	6	....
Dickson City	4,550*	2.53§	2	grout	conc.	6	....
Duquesne	3,585*	2.03§	2	....	slag	8	....
Farrell	5,362*	2.16§	½	tar	slag	12	....
Franklin	5,000*	2.375**	1	grout	conc.	4	....
Greensburg	5,359*	1.60§	1	sand	slag	6	....

BRICK PAVEMENTS (Continued).

City and State.	Yards Laid in 1917.	Av. Cost Per Yard.	Depth of Cushion.	Kind of Filler.	Kind of Base.	Thickness of Base.	Cost of Base.
Pennsylvania (Continued):							
Jeannette	15,003†	1.875[6]	1	sand	slag	6	....
Johnstown	11,759*	2.42[6]	1½	grout	conc.	6	....
Lewisburg	6,800	2.57[6]	1½	....	conc.	5	....
McKeesport	2,700*	1.87§	1½	grout	slag	8	....
Norristown	2,000*		1	grout	conc.	4½	....
No. Braddock...	3,000*	2.39[6]	1	sand	conc.	5	....
Oil City.........	2,045*	2.00-2.11	1	grout	conc.	4	.96
Philadelphia	0.913*	3.009§	1	grout	conc.	6	....
Pittsburgh	56,730*	2.60§	1½	grout	conc.	6	....
Pittston	2,414*	2.34§	...	....	conc.	6	....
Rankin	9,000*	2.33§	1½	grout	conc.	6	....
Reading	1,050*	2.57‡	...	....	laid on old base		....
Shamokin	1,000*	3.30**	2	grout	conc.	6	....
West Berwick...	20,000*	2.19[6]	1½	....	conc.	5	....
Wilkes-Barre ...	370*	2.45[6]	...	....	conc.	6	....
Wilkinsburg	6,542*	3.25§	½-1	grout	conc.	6-8	....
	2,417*	2.32§			conc.	6	....
	2,720*	2.16§			slag	9	....
Williamsport ...	17,249*	2.42[6]	...	....	conc.	6	....
Tennessee:							
Jackson	32,985*	2.05§	1	grout	conc.	4	....
Texas:							
Temple	32,500	1.82§	1½	asphalt	conc.	4	....
Virginia:							
Charlotteville ...	540†	....	2	grout	....	...	....
Washington:							
Seattle	5.06	2.70§	1	grout	conc.	5-6	....
West Virginia:							
Fairmont	2,790†	3.25§	...	....	conc.	5	....
	1,700*	.80	old brick relaid on		sand base	4	....
	300*	1.50	new brick on sand		....	4	....
Huntingdon	42,991*	1.56[6]	6	sand	gravel	6	....
Moundsville	2,540*	2.00§	2	grout	conc.	4	....
Piedmont	780†	2.20[6]	1	grout	cinder	6	....
Wisconsin:							
Eau Claire	2,015†	1.48§	...	sand	sand	...	....
Fond du Lac....	4,929*	1.54[2]	1	asphalt and grout	conc.	6	....
Grand Rapids....	....	2.15§	...	....	conc.	5	....
Janesville	4,560*	2.09	monolithic	....	old macadam	...	....
Milwaukee	20,800*	2.55§	1	grout	conc.	6	....
Wausau	14,300*	2.02[6]	...	....	conc.	5	....
Whitewater	12,850*	2.30[6]	1½	grout	conc.	5	....

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*, By contract; †, by municipality; ‡, includes grading; §, includes base; [6], includes base and grading; **, includes completed pavement; [1], hillside block laid under difficult conditions; [2], laid in street railway track; [3], 2½-inch brick; [4], 3-inch brick; [5], includes removal of old asphalt paving, including old concrete base, and cost of constructing new base.

WATERBOUND MACADAM AND SURFACING OILING.

City and State	Amount laid in 1917	Av. cost per yard	Thickness of macadam, inches	Is Telford base Used?	Miles or yards oiled in 1917	Cost per yard
Alabama:						
Dothan	....	....	..	..	½	$0.04
Tuscaloosa	....	....	..	..	20,000	.15
Arizona:						
Globe	8,391†	$0.184	4	no	......	....
California:						
Alameda	....	....	..	..	5½	.13
Berkeley	....	....	..	..	175,000	.20
Eureka	3†	....	4	no	......	....
Oakland	....	....	..	..	27½	.06
Pasadena	....	....	..	..	88,000	.036-.09
Petaluma	....	....	..	..	2	.18
Redlands	....	....	..	..	5	900.00
Richmond	8,538*	.45	6-8	no	......	....
San Bernardino....	....	....	..	..	5	....
San Francisco.....	26,223	.563	..	..	......	....
Santa Monica......	....	....	..	..	115,000	.09
Colorado:						
Colorado Spgs......	....	....	..	..	2	.07
Connecticut:						
Ansonia	....	....	..	..	200,000	.055
Bristol	....	....	..	..	120,000	.027
Hartford	33,770†	.57	8	no	1,463,942	.0334
Middletown	....	....	..	..	175,000	.04
New Haven	4,300	....	..	no	......	....
Putnam	....	....	..	..	3	.01⅓
Southington	....	....	..	..	2	.02½
Stamford	11,045†	resurfacing job			23	.05
Wallingford	....	....	..	..	45,000	....
Willimantic	....	....	..	..	3	....
Winchester	....	....	..	..	21	60.00
Dist. of Columbia:						
Washington	23,455	1.25	..	..	30	.06
Georgia:						
Rome	3†½	.58	6	no	......	....
Illinois:						
Aurora	....	....	..	.	2	30.00
Chicago Heights...	1.000*	.80	..	.	6	no data
Cicero	....	....	..		12	....
E. St. Louis........	½†	$1,800.00	old base		2	80.00
Oak Park	....	....	..	..	30	165.00
New Hampshire:						
Franklin	....	....	..	..	5	.50
Laconia	5,333†	1.00	4	partly	111,044	.292
Nashua	....	....	..	..	10	.10
New Mexico:						
Roswell	....	....	..	..	11,847	.089
New Jersey:						
East Orange	....	....	..	..	750,000	.03
Irvington	3,000	....	..	..	......	....
Madison	....	....	..	..	13.2	305.05
Montclair	....	....	..	..	20	135.00
Newton	....	....	..	..	3	350.00
Nutley	....	....	..	..	121,526	.03
Orange	....	....	..	..	950,000	.01
Plainfield	....	....	..	..	29.9	.034
Ridgefield Park.....	7,500*	.95	6	no	20,000	.04
Ridgewood	7,800*	.75	4	no	1,600	.12
Rutherford	....	....	..	..	9	.18
Westfield	....	....	..	..	225,000	.03
West Orange.......	....	....	..	..	14	169.00
New York:						
Albany	....	....	..	..	220,476	.018½
Auburn	25,900†	1.25	..	no	14	228.00
Binghamton	....	....	..	..	163,206	.03
Buffalo	....	....	..	..	196,352	.03
Corning	....	....	..	..	6½	144.55
Elmira	....	....	..	..	33,875	.132
Fulton	....	....	..	..	3	406.00
Geneva	....	....	..	..	6	250.00
Glens Falls........	....	....	..	..	295,000	.01¾
Gloversville	....	....	..	..	66,000	.018½
Haverstraw	....	....	..	..	16	34.00
Little Falls........	300†	.90	4	no	88,000	.02½
New York City:						
Bronx	15,570*	1.32	..	no	1,240,000	.03¼
Brooklyn	....	....	..	..	1,622,710	.03 1/5
Manhattan	....	....	..	..	84,000[4] 84,000	.01½ .04
Queens	....	....	..	..	60	....
Niagara Falls......	6,059†	.25	repairs only		......	....

Taylorville	....	....	..	..	¼	400.00
Waukegan	....	....	..	..	7	300.00
Indiana:						
Crown Point	....	....	..	..	11	.04
Gary	5,963*	1.00	..	no	......	....
Greencastle	....	....	..	..	40	50.00
Hartford City	1,000	1.25‡	..	..	......	....
Kendallville	....	....	..	..	1	440.00
Madison	....	....	..	..	2	.04
Marion	2,665*	.97½‡	12	no	......	....
Noblesville	....	....	..	..	7	.03½
Richmond	....	....	..	..	21,000	.04½
Seymour	3,000*	1.25	7	no	1	600.00
Shelbyville	....	....	..	..	68,914	.05
Iowa:						
Ames	....	....	..	..	1½	200.00
Burlington	....	....	..	..	2	.03¹
Cedar Rapids	....	....	..	..	3	275.00
Charles City	....	....	..	..	146,000	.021
Davenport	....	....	..	..	4	100.00
Dubuque	24,493*	.85	11	yes	8	....
Fairfield	....	....	..	..	1,172	.07
Muscatine	....	....	..	..	2,700	.02½
Oelwein	....	....	..	..	30,000	.02¾
Kansas:						
Fort Scott	{ 2,700*	1.22	11	..	......	....
	{ 3,600*	.75	9	no	33,800	.017¾
Leavenworth	....	....	..	..	3½	.03¾
Olathe	....	....	..	..	7	530.00
Ottawa	....	....	..	..	1	150.00
Parsons	....	....	..	..	455,760	.03
Kentucky:						
Carlisle	21,660†	.54	..	no	1½	.018
Louisville	....	....	..	..	1,414,052	.045½
Madisonville	9,200†	.78	6	..	23,400	.04½
Maine:						
Augusta	2,400†	1.50	..	..	7	633.00
Bath	900†	1.00	..	no	3	....
Portland	....	....	..	..	65,549	.05½
Maryland						
Cumberland	....	....	..	..	½	....
Frederick	14,247†	.56⅜	6	no	137,200	.031
Massachusetts:						
Adams	....	....	..	..	23,000	.05²
Cambridge	....	....	..	..	60	500.00
Greenfield	14,900	....	6	partly	16	....
Haverhill	....	....	..	..	35	39.00
Lawrence	....	....	..	..	15½	500.00³
Lowell	2,608	....	6	no	1,500,000	....
Marlboro	....	....	8	some	15,000	.06
New Bedford	103,600†	....	6	no	96¼	.014¼
Newton	....	....	..	..	100	400.00
Northampton	2,500	....	..	no	......	....
Norwood	....	....	..	..	185,000	.02
Peabody	8,000†	.35	..	no	33	.04½
Revere	....	....	..	..	30	6,000.00
Waltham	2,660†	.50	5	no	24.9	545.75
Webster	....	....	..	..	3	.10
Westfield	....	....	..	..	17.7	358.30
Michigan:						
Adrian	....	....	..	..	9.8	407.49
Ann Arbor	....	....	..	..	11.111	.03
Battle Creek	5,516†	.72	..	..	3	300.00
Cadillac	5,546†	.72	..	slag	......	....
Marquette	6,000*	.80	9	yes	27,000	.037
Saginaw	....	....	..	..	5	100.00
Minnesota:						
Austin	....	....	..	..	14.3	528.00
Mankato	....	....	..	..	4	525.00
Northfield	....	....	..	..	7	300.00
Stillwater	....	....	..	..	8	950.00
Virginia	....	....	..	..	2	.01¾
Missouri:						
Boonville	....	....	..	..	8	.05
Brookfield	....	....	..	..	30	.041
Excelsior Spgs	....	....	..	..	3	.02
Fulton	....	....	..	..	90,000	.02¾
Independence	....	....	..	..	4	290.00
Joplin	49,478	1.75	9-12	no	55,493	.11
Kirkwood	4,267†	.61	10	yes	15	127.00
Monett	....	....	..	..	10,000	.06
Sedalia	....	....	..	..	2½	300.00
St. Charles	....	....	..	..	22	301.54
Webb City	....	....	..	..	14,813	.03½
Ogdensburg	3,000†	.60	6	no		
Oneida	....	....	..	..	118,116	.018½
Oneonta	....	....	..	..	{ 2½	400.00
					{ 60,729	.018
Schenectady	....	....	.	..	32,750	.02
North Carolina:						
Asheville	....	....	..	..	5	.04
New Bern	....	....	..	..	15,000	.05
Ohio:						
Ashtabula	....	....	..	..	24,272	.04
Bellefontaine	....	....	..	..	0.3	533.00
Cincinnati	....	....	..	..	125	.04½
Circleville	....	....	.	..	32,000	.07
Findlay	1,457	.90	6-8	no	2	370.00
Greenville	4,607*	.70	..	no	30,000	.04¼
Norwood	....	....	..	..	140,000	.06
Piqua	6,115*	1.20	6½	2-course	......	....
St. Bernard	400	1.00	9	no	6	500.00
Sandusky	....	....	..	..	14	.03½
Springfield	6,000*	.50	6	no	......	....
Troy	....	....	..	..	40,000	.01¾
Westerville	....	....	..	..	2	.02½
Yougstown	1,963*	1.15	..	no	......	....
Oregon:						
Eugene	5,000*	.68	7	no	......	....
Pennsylvania:						
Carlisle	....	....	..	..	5	.08⅓⁵
Columbia	13,200†	.29	..	slag	80,000	.03
Easton	4,981⁶	1.01	8	no	15	.019
Freeland	1½†	.56	..	no	......	....
Hazleton	50,090†	.34	6-10	no	4,200	.03½
Lansford	....	....	..	..	11,657	.032
Norristown	1,560†	.45½	..	no	1¼	....
Philadelphia	3.24*	1.10	..	no	163	.01⅔
Reading	....	....	..	..	523,047	.02
St. Marys	....	....	..	..	½	300.00
Waynesboro	3,811†	.35	8	..	16,500	.07⅜
Williamsport	....	....	..	..	17,927	.036
Rhode Island:						
Providence	35,180†	....	6	no	147	396.00
South Dakota:						
Lead	3,805†	1.45	10-12	no	......	....
Tennessee:						
Clarksville	20,000*†	.25	7	no	5	640.00
Greeneville	1†	.40	6	no	......	....
Lebanon	3†	.30-.40	10-13	no	8	88.00
Texas:						
Longview	2,200†	.34	8	no	......	.05
San Angelo	2,500†	.80	6	yes	......	....
Vermont:						
Burlington	....	....	..	..	448,000	.014
Montpelier	....	....	..	..	10	200.00
St. Albans	5,084†	.40	4	yes	100,000	.01¾
St. Johnsbury	....	....	..	..	70,250	.02
Virginia:						
Charlottesville	....	....	..	..	5	250.00
Martinsville	....	....	..	..	1,700	.08
Pulaski	3,300*	.70	..	no	18,000	.12½
Winchester	....	....	..	..	150,000	.07
Washington:						
Spokane	....	....	..	..	1	....
Tacoma	....	....	..	..	16	....
Walla Walla	....	....	..	..	10,460	.09½
Wisconsin:						
Baraboo	....	....	..	..	5	.03
Eau Claire	....	....	..	..	185,000	.02
Fond du Lac	....	....	..	..	5	400.00
Grand Rapids	½†	.60	..	yes	3	300.00
Madison	....	....	..	..	365,800	.028
Manitowoc	27,000†	.35	..	no	196,000	.01⅝
Marinette	....	....	..	..	15	.021
Menasha	3,000	....	..	no	1,000,000	.001⅔
Milwaukee	....	....	..	..	118	.07
Oshkosh	....	....	..	..	17	310.00
Two Rivers	....	....	..	..	5⅓	200.00
Waukesha	....	....	..	..	27,600	.10
Waupaca	....	....	..	..	33,000	.02
Wausau	....	....	..	..	6	406.00
Wauwatosa	....	....	..	..	30,000	.08½
Wyoming:						
Rock Springs	....	....	..	..	24,826	.38

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*, Work done by contract; †, by municipality; ‡, prices include grading; ¹, per front foot for one application; ², labor cost only; ³, two applications; ⁴, dirt road treatment; ⁵, price per foot; ⁶, work was outside city limits; ⁷, bituminous surface layer placed on concrete.

CREOSOTED WOOD BLOCK PAVEMENTS.

City and State.	Yds. laid in 1917.	Av. cost per sq. yd.	Preservative		Base		
			Lbs. of	Sp. gr. of	Kind.	Thickness.	Cost.
Connecticut:							
New Haven	29,359*	....	20	1.08-1.14	....	..	...
Delaware:							
Wilmington	1,806*	$3.80‡	laid along car tracks		Conc.	5	...
Illinois:							
Moline	5,781*	3,095§	16	1.07-1.12	....	6	...
Iowa:							
Dubuque	30,882*	2.05	..	...	used old base		
Kentucky:							
Louisville	608† 2,527*	2.78§	16	1.07	Conc.	6	...
Paducah	5,524	2.16	16	On old base. Cost includes removing old pave. and putting in mortar cushion			
Louisiana:							
New Orleans	50,500*	2.02¶	16	1.10	Conc.	6	$1.15
Massachusetts:							
New Bedford	3,218†	....	..	....	....	..	...
Michigan:							
Detroit	17,275*	4.38§	16-20	1.10	Conc.	6-8	...
Minnesota:							
Minneapolis	167,500†	....	16	1.10	Conc.	5	...
St. Paul	35,000	2.85‡	14	....	....	5	...
Missouri:							
Kansas City	53,340	3.20§	16	....	Conc.	8	...
New Jersey:							
East Orange	13,950	3.72‡	3½-in. blocks	....	Conc.	6	...
Jersey City	13,045*	2.75§	20	1.03-1.10	Conc.	5	...
Newark	41,147*	3.44‡	..	1.07-1.12	Conc.	6	...
Orange	25,500*	2.25	17	1.07-1.12	....	..	1.00
New York:							
Buffalo	1,616*	4.46**	16	....	....	..	...
New York:							
Manhattan	19,705*	3.26‡	14	1.03-1.08	Conc.	6	1.15
Niagara Falls	13,715*	4.10**	16	1.08-1.14	Conc.	6	...
Rensselaer	200*	2.45§	..	....	....	5	...
Ohio:							
Cincinnati	6,380*	3.43‡	16	1.06-1.07	Conc.	5½	...
Lima	1,812*	3.60§	16	....	Conc.	7	...
Norwood	12,500*	2.90§	18	1.13	Conc.	6	...
Toledo	18,181*	3.10	16	1.06	Conc.	6	.90
Pennsylvania:							
Lebanon	9,500	3.88‡	18	1.08-1.14	Conc.	5	...
Olyphant	400*	2.75		laid on bridge			
Philadelphia	2,230*	3.577§	..	....	Conc.	6	...
Pittsburgh	2,700*	3.80††	16	1.03-1.08	Conc.	6	...
South Dakota:							
Mitchell	223*	3.30§	..	....	Conc.	6	...
Texas:							
San Angelo	38,000†	.65	old blocks relaid with asphalt filler				
Washington:							
Seattle	.52*	2.50§	12	1.04	Conc.	5-6	...
Wisconsin:							
Eau Claire	6,300†	3.43§	..	....	Conc.	..	...
Milwaukee	25,872*	2.46§	23	1.1	Conc.	6	...

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*By contract; †by municipality; ¶includes grading; ‡includes base and grading; §includes base; **includes completed pavement; ††repaving work.

SHEET ASPHALT.

City and State	Yards Laid in 1917	Average cost per sq. yard	Thickness of surface	Thickness of binder	Base		
					Kind.	Thickness.	Cost.
California:							
Los Angeles	235,145*	$0.99‖-1.49‖	1½-2	Paint-1	conc.	4-6	....
Oakland	2.6*	1.80‖	1½	2	conc.	6	....
Petaluma	3,500*	.39	1½	...	Repaving	...	....
San Francisco	550,464*	1.81‡‖	...	...	conc.	6	....
Santa Barbara	60,000*	1.51‡‖	...	...	conc.	4-6	....
Connecticut:							
Hartford	38,068*	1.85‖	1½	1½	conc.	6	....
New Haven	59,632*	2.43‡‖			conc.	6	....
		1.693‡	1½	1½	mac.	...	....
Delaware:							
Wilmington	66,000	1.52‡‖	2	...			
	10,200	2.20‡‖	2	1	conc.	5	....
Dist. of Columbia:							
Washington	110,000	1.44‖	2½	2	conc.	6	....
Illinois:							
Aurora	35,027*	1.76§	1½	1½	conc.	5	....
Evanston	3,580*	1.635	1½	1½	mac.	8	$0.30
Moline	4,732*	1.81‖	2	1½	....	5	....
Indiana:							
Fort Wayne	53,162*	1.85‖	1½	...	conc.	6	....
South Bend	18,917*	1.81‖	3½	...	....	7	....
	22,858*	1.82‖	3	...	conc.	5	....
Iowa:							
Cedar Falls	32,242*	1.89‖‡ 1.57‖‡	1½-2	1	conc.	5-6	....
Cedar Rapids	30,820	1.99‖	2	1	conc.	6	....
Independence	53,294*	1.51‖	...	...	conc.	5	....
Mason City	40,000*	1.79‡‖	1½	1	conc.	6	....
Kentucky:							
Louisville	19,950† 14,060*	1.79‖	2	1	conc.	6	....
Maysville	17,000*	1.45	...	...	conc.	6	.85
Louisiana:							
New Orleans	9,600*	1.84‡‖	1½	1½	conc.	6	....
Massachusetts:							
Peabody	13,400*	1.60‡	1	3	....	...	....
Buffalo	106,357*	3.47	repaving work		....	...	....
	107,060*	3.94§	2	1½	conc.	6-9	....
Syracuse	35,228*	2.01‖	2	1	conc.	6	....
White Plains	40,269*	1.70‡	1	3	old base used		....
North Carolina:							
Asheville	5,244*	1.32	...	...	conc.	6	.99
North Dakota:							
Bismarck	129,740*	1.90‖	1½	1	conc.	5	....
Ohio:							
Cincinnati	8,485*	2.60‖	1½	1½	conc.	6	....
Findlay	18,770	1.90‖	1½	1	conc.	6	....
Hamilton	26,274	1.87‡‖	1½	1	conc.	6	....
Lakewood	3,501*	1.08	1½	1	conc.	6	1.15-1.23
Lima	34,545*	2.25‖	2	1	conc.	6	....
Lorain	35,000*	3.10§	1½	1	conc.	6	....
Marion	45,000*	1.26	1½	1	conc.	6	.90
Springfield	141,000*	2.30	2	1	....	...	....
Toledo	2,985*	1.55	...	...	repaving		
	58,159*	2.41‖	1½	1½	conc.	6	....
Washington C. H.	8,600*	2.36‖	1½	1	conc.	5	....
Xenia	30,167*	3.22‡‖	1½	1	....	6	....
Pennsylvania:							
Harrisburg	10,526*	1.90‡‖	2	1	conc.	6	....
Johnstown	19,330*	2.23‡‖	2	1	conc.	6	....
Philadelphia	18,433*	2.284‖	1½	1	conc.	6	....
Pittsburgh	52,708*	2.60‡	1½	1½	conc.	6	....
	11,737*	2.83	repaving work		....	...	....
Reading	21,410*	1.50	1½	1½	resurfacing		....
Scranton	8,327*	2.17‡‖	2	1	conc.	6	....
Wilkes-Barre	57,846*	2.19‡‖	...	...	conc.	6	....
Williamsport	9,250*	1.32‡	...	...	....	...	....
Rhode Island:							
Providence	35,685*	2.38‡‖ 2.65‡‖	1½-2	1-1½	conc.	6	....
South Carolina:							
Greenville	3,000*	2.15‡‖	2	1	conc.	4	....
South Dakota:							
Madison	20,000	1.85‖	...	...	conc.	5	....

Michigan:							
Detroit	65,714	3.15‖	2	1½	conc.	6-8	....
Flint	116,000	.75	1½	1	conc.	6	.80
Grand Rapids	11,245*	1.24	3	...	conc.	6	.65
Mississippi:							
Laurel	14,797*	1.60‖	1½	none	conc.	4	....
Vicksburg	702	2.15‖	2	...	....	...	....
Missouri:							
Kansas City	14,740	2.17‖	2	2	conc.	6	....
Nebraska:							
Grand Island	58,000	1.75‖	1½	1½	conc.	4	....
Hastings	50,000*	1.84‖	1½	1½	conc.	4	....
Lincoln	50,333*	1.90‡‖	1½	1½	conc.	6	....
New Jersey:							
Atlantic City	64,913*	0.95	1½	1½	conc.	6	.90
Bayonne	31,200*	2.25‖	1½	1½	conc.	5	....
Camden	1,898†	2.20‖	...	...	conc.	6-8	....
Elizabeth	0.4*	2.60‡‖	1½	1½	conc.	6	....
Newark	49,232*	2.37§	1½-2	1½	conc.	6	....
New York:							
New York:							
Bronx	149,600*	1.47‡	2	1	conc.	6	1.075
Brooklyn	20,256*	2.346‖	2	1	conc.	6	....
Manhattan	278,191*	1.72‡	1½	1½	conc.	6	1.15
Albany	14,500*	2.10‖	2	1	conc.	6	....
Texas:							
Clarksville	4*	1.56‖	...	2	conc.	4	....
Cleburne	22,000*	2.00‡‖	2	1½	conc.	5	....
Port Arthur	54,000	1.75‖	...	...	recon.	4	....
Utah:							
Ogden	95,221*	1.74	1½	1½	conc.	6	....
Salt Lake City	33,867*	1.02	1½	1½	conc.	6	.67
Washington:							
Aberdeen	11,025	1.85‖	...	...			
	5,106	1.90‖	2	paint	conc.	6	....
Bellingham	27,437	1.47‖	1½	¾	conc.	6	....
Olympia	7,250*	1.28‖	2	...	conc.	4-6	....
Seattle	9.98*	1.60‖	2	1	conc.	5-6	....
Tacoma	2,046*	1.20	...	...	conc.	6	1.00
Wisconsin:							
Beloit	25,650	1.25‖	1½	1	conc.	5	....
Green Bay	3,940*	1.74‖	2	1	conc.	6	....
	2,840*	1.97‖	1½	1½	conc.	5	....
Madison	6.00*	2.15‖	1½	1	....	5	....
		2.37‖	2	1	....	6	....
Menasha & Neenah	16,000*	.94	1½	1	conc.	5	.87
Milwaukee	194,590*	2.15‖	1½	1½	conc.	6	....
West Allis	13,000*	1.57	1½	1½	resurfacing		....

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*By contract; †by municipality; ‡includes grading; ‖includes base; §includes curbs, gutters and other items, everything.

BITUMINOUS CONCRETE PAVEMENTS.

City and State	Yards laid in 1917	Average Cost per sq. yd.	Thickness of surface, inches	Base		
				Kind	Thickness	Cost
Alabama:						
Gadsden	40,632*	$1.50§	2	conc.	5	......
Arkansas:						
Fort Smith	1¼*	1.18**	..	old mac.	10-12	$0.60
California:						
Berkeley	126,000[2]*	1.44‡	2	conc.	5-6	......
Los Angeles	10,751	1.31§ .86§ 1.89§	1½	bit. conc. conc.	4 4 5	......
	123,656*	1.31-1.58 warrenite		......	..	......
Marysville	48,404	1.35‡	1½	conc.	4	......
San Jose	2,200[1]	1.44**	laid on old base			
	14,536	1.35§	6	asph. conc.	4½	......
Stockton	71,094*	......	..	......	..	......
Colorado:						
Boulder	26,000*	1.00	2	conc.	5	.90
Connecticut:						
Derby	7,500*	......	..	......	..	......
Winchester	9,151*	1.75‡ warrenite		stone	6	.83
Illinois:						
Berwyn	48,000*	1.80‡	2	conc.	6	......
Chicago	114,305*	1.88§	..	conc.	6	......
Chicago Heights	28,000*	2.00**	2	conc.	6	......
Evanston	2,742	1.28	2	conc.	5	.35
Oak Park	12,285 10,142 24,837	1.32§ 1.67§ 1.90§	2	old mac. conc. conc.	2 4 6	......
Peoria	2,000*	1.60§	2½	......	6	......
Springfield	¼	124[1]	2½	......	..	......
Indiana:						
Fort Wayne	56,848*	1.74§	2	conc.	6	......
Frankfort	5,534*	1.56§	2	conc.	5	......
Indianapolis	4.08*	2.40‖	2	conc.	6	......
South Bend	70,663	1.56§	2	conc.	5	......
Iowa:						
Algona	44,040*	1.53‖	..	conc.	4	......
Boone	1,600†	1.60	Top repairs only		..	......
Cedar Falls	11,114*	1.50‖	2	conc.	5	......
Cedar Rapids	13,200	1.68§	2	conc.	4	......
Dubuque	220*	1.80§	2	conc.	5	......
Fayette	15,000	1.89§	2	conc.	5	......
Kansas:						
Kansas City	17,835	1.44‖	..	conc.	4	......
Pittsburg	20,289	1.45§	2	conc.	4	......
Salina	¾*	1.00	Laid on old base		..	......
Topeka	32,000[1]*	.90	2	on old base	..	......
	49,500[2]*	1.39	..	conc.	4	......
Wellington	12,000*	1.35	2	conc.	4	......
Louisiana:						
Shreveport	46,961†	1.60‖	2	conc.	5	......
Massachusetts:						
Marlboro	5,000	1.37§	2	stone and tar	6	......
Peabody	9,300*	1.45‡	..	......	..	......
Somerville	4,014* 6,003*	2.05‖ 1.20‡	4	conc.	5	......
Michigan:						
Bay City	12,380	1.98§	2	......	6	......
Detroit	526,500*	2.38§	2	conc.	6-8	......
Grand Rapids	16,998*	1.32	2	conc.	5	.73
Kalamazoo	4,354[3]	1.80§	2	conc.	6	......
Lansing	13,000	2.00**	2½	conc.	6	......
Minnesota:						
Minneapolis	10,600†	......	3	conc.	5	......
St. Paul	90,000	1.75‖	2	conc.	5	......
Mississippi:						
Greenwood	10,000*	1.50§	2	conc.	4	......
Missouri:						
Joplin	11,140*[4]	1.75‖	..	conc.	6	......
Springfield	2,133* 10,631*	.97‡ 1.523	..	old brick conc.	4	......
Montana:						
Anaconda	46,861*	1.65§	2	bit.	3	......
Great Falls	17,555*	1.56§	4	conc.	4	......
Nebraska:						
Lincoln	54,554	1.70‡	2	......	6	......
Omaha	67,175*	1.70§	2	conc.	5	......
New Hampshire:						
Laconia	974*	1.00	3	old mac.	8	no date
Nashua	1,500†	.80	..	old mac.	8	......
New Mexico:						
Roswell	11,847*	1.65**	2	conc.	..	......

BITUMINOUS CONCRETE PAVEMENTS (Continued).

City and State	Yards laid in 1917	Average Cost per sq. yd.	Thickness of surface, inches	Base Kind	Base Thickness	Base Cost
New Jersey:						
Elizabeth	0.6*	2.30‖	3	conc.	4	......
Jersey City	568*	1.79‖	3	conc.	5	......
Rutherford	20,870*	3.11**	..	......	..	......
West Hoboken	18,233*	1.50§	2½	conc.	5	......
West New York	18,841*	2.38‖	..	conc.	5	......
New York:						
Albany	1,600	1.90§	2	conc.	6	......
New York City:						
Bronx	21,450*	1.17‡	..	conc.	4	.65
Manhattan	6,717*	1.60‡	2	conc.	6	1.15
Queens	75,186†*	......	2	conc.	6	......
Richmond	110,514*	1.45	2	conc.	6	1.16
Niagara Falls	4,623*	2.58**	2	conc.	6	......
Schenectady	7,721* 780*	2.49‖ 3.37‖	2	conc.	6	......
Utica	2,114	1.12‖	..	no base	..	......
North Carolina:						
Asheville	49,732*	1.05	..	old mac or bit. conc.	6	.20 .99
Winston-Salem	37,236*	1.49‖	2	conc.	4	......
Ohio:						
Cleveland	38,694*	1.30	..	conc.	6	1.08
Findlay	7,547	1.65§	2	conc.	6	......
Hamilton	5,940	1.73‖	2	conc.	6	......
Lakewood	23,861*	1.30	2	conc.	6	1.15-1.23
Lima	20,604*	1.95§	2	conc.	6	......
Newark	6,805	1.85‖	2	......	4	......
Springfield	17,000*	2.15‖	2	conc.	6	......
Toledo	13,950*	......	2	conc.	6	......
Wapakoneta	12,602*	2.10§	..	conc.	6	......
Youngstown	20,300*	2.10§	2	conc.	5	......
Oregon:						
Ashland	10,201	1.48§	2	conc.	4	
Eugene	2,000*	1.65§	1½	conc.	6	......
Salem	33,724† 19,964†	.45 .60	1½ 2	conc. mac. redressed	4 ..	.55 .19
Pennsylvania:						
Philadelphia	1.56*	1.68§	2	......	..	......
South Carolina:						
Greenville	55,000*	1.69‖	2	conc	4	......
South Dakota:						
Mitchell	28,101*	1.80§	2	conc.	5	......
Sioux Falls	27,135*	1.72‖	..	stone	8	......
Tennessee:						
Dyersburg	20,000	1.62‖	2	conc.	4	......
Greeneville	8.37*	1.47	2	conc.	5	......
Murfreesboro	58,000*	1.14§	2	stone	..	......
Texas:						
Temple	11,320	1.37§	2	conc.	4	......
Waxahachie	25,000	1.40**	2	conc.	6	......
Vermont:						
St. Albans	1,446*	1.10	..	stone	3	......
Washington:						
Seattle	0.36*	1.60	2	conc.	5-6	......
Yakima	52,115*	1.21§	..	conc.	4	......
Wisconsin:						
Beloit	9,780*	1.18§	2	conc.	5	......
Janesville	20,561*	1.51§	2	conc.	5	......
Milwaukee	81,467*	1.62§	2	conc.	5	......
Oshkosh	49,786	1.96‖	2	conc.	5-6	......

*, By contract; †, by municipality; ‡ includes cost of grading; ‖, includes cost of base and grading; §, includes cost of base; **, includes all costs necessary for completed pavement; [1], repaving; [2], Topeka; [3], surface done by contract; base by city; [4], natural pavement.

BITUMINOUS MACADAM.

City and State.	Yards Laid in 1917.	Average Cost Per Sq. Yd.	Thickness of Macadam.	Gallons Per Sq. Yd.
California:				
Alameda.	700*	$0.85†	.....	1½
Los Angeles	5,544*	.63–.99	3–6	......
Oakland.	7.5*	.75	8	1.83
Pasadena.	17,396*	.67	4–5–6	1½
Petaluma	30,000*	.45	.....	1½
Pomona.	5,861†	.31	1	½
Redlands.	45,000†	.45	5	1¼
Richmond.	8,341*	.45	6	2
Riverside.	19,800*	.63‡–.81‡	4	1
Santa Ana	23,880*	.45	2	¾
Santa Monica	11,018*	.57	4	1
Connecticut:				
Ansonia.	800	1.43	8	2½
Greenwich.	4,000*	1.25	4	2½
New Haven	5,043*	1.10	6	2½
Stamford.	3,400†	.75	5	2¼
Wallingford.	1,000†	1.50	.....	2½
Illinois:				
Ardmore.	23,000*	1.27	.....	2
Chicago	327,982*	1.46	10½	2
Evanston.	12,854*	.83	3	2
Freeport.	15,000*	.70	9	1
Hinsdale.	8,500*	1.39	.....	2
Marion	7,000* 2¼*	1.62 1.19	....	3¼ 2
Peoria.	30,000*	1.30	2½	2.2
Waukegan.	1,923*	1.65	8½	2¼
Indiana:				
Crown Point	10,000	1.80‡	6	2
Frankfort.	18,700†	.68½	2	2
Gary.	5,677*	1.73	.....	2
Hartford City	37,000	1.30	.....	2
Marion.	2,650*	.828	4	2½
Kansas:				
Leavenworth	45,600	1.47	3	2½
Osawatomie.	2,100*	....	9	3
Rosedale.	2,225*	1.00‡	8–12	1½
Maine:				
Bath.	2,500†	1.25‡	2	2
Portland.	5,693	2.33	.....	2–2½
So. Portland	2,450	1.25	6	2½–3
Maryland:				
Cumberland.	2,016†	....	6	2
Massachusetts:				
Arlington	32,145	....	4	2
Brockton	31,821†	1.60	5	2¼
Cambridge	61,176†	.75‡-1.00‡	6	1½
Lawrence	2,080†	....	.....	3
Lowell	33,687†	....	5	2½
Lynn	24,522†	1.20	4	.....
Marlboro	5,775†	.71	3	2.4
New Bedford	45,500†	....	6	2¼
Newton	42,000†	1.00‡	2½	2
Norwood	7,000†	.90**	6	2½
Peabody	43,400*	.96	3	2½
Revere	14,000†	1.27**	6	2¼
Somerville	0.83* 4.44†	1.01 1.07	5	2
Waltham	17,620†	1.40	6	3
Webster	2,021†	.98	10	1½
Worcester	35,356†	1.00	6	2¼
Michigan:				
Grand Rapids	3,116*	1.20	3	2
Holland	14,000†	.82	2	2½
Marquette	1,266† 3,354*	.67 1.22	2½	2
Missouri:				
Boonville	5,000*	1.26	2½	2 1/5
Excelsior Spgs.	11,000	.80‡	3	2¼
Kansas City	18,000	1.21	10	2–3
Monett	16,000*	1.20	.....	2.2
Springfield	2,262	1.24¾	2½	2.2
New Hampshire:				
Laconia	7,715†	1.15‡	6	2⅓
New Jersey:				
Garfield	3,190*	1.10‡	7	1½
Madison	6,205*	1.38	4	1½
Montclair	1,481*	1.49	3	2
Ridgewood	6,600*	.64	4	.....
Rutherford	4,320*	1.12**	.....	2¼
Westfield	40,000*	0.91‡	6	¾
West Orange	4,300*	1.06-1,51	7	1½
New York:				
Auburn	6,200†	1.35‡	.....	1½-2
Binghamton	36,200†	1.35‡	4	2
Little Falls	2,345*	1.60‡	6	2½
New York City.				
Queens	80,332*†	....	....	....
Richmond	27,616*	1.54	6½	2⅓
Ogdensburg	760†	....	.....	1¼
Syracuse	16,621*	1.39	9	2
Ohio:				
Cincinnati	908*	1.65‡	9	2-2½
Findlay	2,896	.80	7	2½
Hamilton	4,330	1.23‡	2½	2¼
Norwood	12,100*	.90	9	2-3½
Pennsylvania:				
Norristown	3,900†	.59½‡	6-8	1½-2
Philadelphia	2¼	2.46	.....	2¼
Waynesboro	2,500†	.79**	3	2¼
Rhode Island:				
Providence	11,686†	....	7½	1¾-2¼
Woonsocket	1†	....	4-6	....
Tennessee:				
Memphis	3,510†	.75	....	....

BITUMINOUS MACADAM (Continued).

City and State.	Yards Laid in 1917.	Average Cost Per Sq. Yd.	Thickness of Macadam.	Gallons Per Sq. Yd.
Texas:				
Longview	5,000†	.76‡	6	2
San Angelo	42,000	....	.....	...
Virginia:				
Charlottesville	5,000*	....	8	2½
Danville	2,700†	.73‡	2	3
West Virginia:				
Bluefield	9,571	1.50‡	2½	2½
Wisconsin:				
Janesville	10,738*	1.36	2	2½
Madison	.04	....	3	2½
Waukesha	2,259*	1.20	.....	2
Waupaca	600†	.85‡	.....	2½

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*By contract; †work done by municipality; ‡cost includes grading; ‡‡cost includes base and grading; **cost includes all work necessary to completed pavement.

GRAVEL PAVEMENTS.

City and State.	Yards Laid in 1917.	Aver. Cost Per Sq. Yd.	Was Gravel Rolled?
Alabama:			
Huntsville	62,500†	$0.11½	...
Montgomery	10,000	.40	No
Selma	10,800*	.78	No
Tuscaloosa	45,000	.60	No
Colorado:			
Colorado Springs	700,000†	.70	No
Fort Collins	16,110	..	Yes
Georgia:			
Rome	11[1]	.20	Yes
Idaho:			
Pocatello	180,000[2]*	.22	Yes
Indiana:			
Crawfordsville	4,921	.35	No
Terre Haute	3,826*	.48	Yes
Iowa:			
Marshalltown	1.6*	.55	Yes
Muscatine	5,700†	.25	Yes
Kansas:			
Cherryvale	54,500*	.15	No
Emporia	¼*	.35	Yes
Kentucky:			
Paducah	⅛	.41‡	Yes
Louisiana:			
Kentwood	4*	..	No
Maine:			
Augusta	32,000†	1.50	Yes
Gardiner	2,800†	.60	No
Lewiston	1	..	Yes
Waterville	7,000†	..	Yes
Massachusetts:			
Greenfield	13,400	..	Part
Haverhill	6,770†	.11	No
Lowell	17,528†	..	Yes
Newton	3,000†	.75	Yes
North Adams	6	..	Yes
Peabody	9,600†	.17	Yes
Revere	5,000†	.40	....
Woburn	91,280†	..	Yes
Michigan:			
Bay City	3¼†	..	No
Grand Rapids	2,990*	.78	Yes
Holland	1†	.50	Yes
Marquette	15,000	.10	No
Port Huron	5,000	..	No
Saginaw	10,200	.33	Yes
Minnesota:			
Austin	½	..	No
Faribault	3†	.08	No
Mankato	50,000	..	....
Stillwater	1†	.38	Yes
Mississippi:			
Clarksdale	6,000†	.60‡	No
Columbus	4,390†	.20	Yes
Jackson	1†	..	....
Laurel	1,546*	.50	Yes
Missouri:			
Monett	5,000†	.65‡	Yes
Webb City	2*	.22‡	Yes
Montana:			
Miles City	3†	500.00[4]	No
New Hampshire:			
Franklin	4/5†	.50‡	Yes
Nashua	20,000	.20	Yes
New York:			
Herkimer	3	.60	Yes
Hornell	10†	..	Yes
Mamaroneck	2,000†	1.85[3]	Yes
Oneonta	¼†	..	Yes
Rensselaer	2,000*	.28	Yes
Ohio:			
Urbana	2,700*	.70	No
Washington C. H.	9,000†	.20	No
Xenia	2	.30‡	No
Oregon:			
Corvallis	2	..	Yes
Newburg	3,260*	1.50[3]	Part
Pennsylvania:			
Freeland	½†	.43‡	Yes
Greenville	1,000†	..	No
South Dakota:			
Mitchell	1.6	1,717.40‡[4]	No
Tennessee:			
Dyersburg	1,000	.50‡	Yes
Jackson	3,655†	..	Yes

GRAVEL PAVEMENTS (Continued).

City and State.	Yards Laid in 1917.	Aver. Cost Per Sq. Yd.	Was Gravel Rolled?
Texas:			
Brownwood	3,300†	.55‡	....
Longview	1,000†	.60	No
Temple	3	..	Yes
Waxahachie	20,000*	..	No
Utah:			
Tooele City	18,660†	.09	Yes
Vermont:			
Montpelier	0.7	..	No
St. Johnsbury	2⅓†	..	No
Washington:			
Bellingham	10,000*	.42	No
Olympia	3,000*†	.90	No
Wisconsin:			
Green Bay	1,000	1.50[1]	No
Janesville	3†	..	....
Manitowoc	9,000*	.40-.80	Yes
New London	2,455†	.30	No
Waupaca	1½	23.60[4]	....
Wyoming:			
Cheyenne	12,000†	.10	No

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*Work done by contract; †by municipality; ‡price includes grading; ‡includes all work; [1]chert; [2]mixed with 15% of clay, harrowed, rolled and sprinkled; [3]price per cubic yard; [4]cost per mile.

BITULITHIC PAVEMENTS.

City and State.	Yds. Laid in 1917.	Av. Cost per sq. yd.	Base	
			Kind.	Thickness.
Arizona:				
Phoenix	42,067*	$1.80‡‖	A. C.	3½
California:				
Bakersfield	14,173*	1.37‡‖	Conc.	4
Berkeley	50,000*	1.53‡‖	Conc.	5-6
Long Beach	4.8*	1.26‖	Conc.	4
Los Angeles	137,304*	1.35‖-1.68‖	Conc. & bit.	4, 5 & 6
Marysville	31,888*	1.44‡‖	A. C.	3
Richmond	37,165*	1.71‖	Conc.	5
Stockton	277,700*	....		
Connecticut:				
Ansonia	14,000	2.39‖	Conc.	6
Idaho:				
Moscow	9,280*	2.08‖	Rock	..
Pocatello	21,000	2.00‖	Stu or Con.	4 or 6
Iowa:				
Ames	13,539*	1.89½‡‖	Conc.	5
Davenport	3,319*	1.60	....	..
Dubuque	7,824*	1.55‖	Mac.	..
Emmetsburg	30,000	1.89‖	Conc.	4
Grinnel City	114,119*	1.93‖	Conc.	5
Muscatine	5,439†	1.83‡‖	Conc.	6
Kansas:				
Rosedale	12,095*	2.08‖	Conc.	4
Kentucky:				
Paducah	27,423	2.21‖	Conc.	6
Louisiana:				
New Orleans	34,000*	1.50	Conc.	6
Maine:				
Lewiston	10,000†	...	....	..
Massachusetts:				
Cambridge	6,957†	1.75‡	Old Mac. base	
Northampton	6,880*	1.27	Mac. & Conc.	..
Minnesota:				
St. Cloud	33,340*	2.22‖	Conc.	5
Virginia	21,994*	2.60‖	Conc.	6
Missouri:				
Joplin	15,420*	2.00‖	Conc.	6
Montana:				
Billings	45,777*	2.14‖	Conc.	5
Bozeman	20,000*	1.97‖	Rock	4
Great Falls	17,785*	2.54‖	Conc.	4
Miles City	30,000*	2.30‖	Conc.	5
Nebraska:				
Columbus	98,547	1.94½‡‖	Conc.	5
New Hampshire:				
Franklin	15,000*	2.31‡‖ 1.58‡‖	Conc. Mac.	4
New Jersey:				
Irvington	48,000	2.40‖	Conc.	6
Newark	58,543*	2.52‡‖	Conc.	6
New York:				
Binghamton	14,208*	2.44‡‖	Conc.	5
Elmira	19,219	2.406‡‖	Conc.	5-6
Utica	33,284*	2.74‡‖ 1.45‡	Conc. Resurf.	5
North Caralina:				
Salisbury	10,000*	1.85‖	Conc.	4
Winston-Salem	1,217*	2.00‡‖	Conc.	4
North Dakota:				
Bismarck	17,000	2.38‖	Conc.	5
Fargo	76,125*	2.13‖	Conc.	5
Wahpeton	33,626*	2.29	Conc.	5
Ohio:				
Cincinnati	17,505*	2.78‖	Conc.	6
Cleveland	48,916*	2.43‖	Conc.	6
Lakewood	2,846*	1.30‖	Conc.	6
St. Bernard	24,870	1.90‡	Conc.	6
Pennsylvania:				
Pittsburgh	11,720*	1.85‖	....	..
Rhode Island:				
Providence	28,144*	1.76 2.28‡‖	Resurf. Stone	6
South Dakota:				
Madison	13,500*	2.15‖	Conc.	5

BITULITHIC PAVEMENTS (Continued).

City and State.	Yds. Laid in 1917.	Av. Cost per sq. yd.	Base Kind.	Base Thickness.
Texas:				
Austin	40,045*	2.068‡‖	Conc.	6
	21,822*	1.75‡‖	Conc.	4
Corpus Christi	5,383*	2.48‡‖	Conc.	6
	26,005*	1.95‡‖	Conc.	4
Paris	42,000*	2.35‖	Conc.	5
Utah:				
Salt Lake City	27,721*	1.23	Bit. Mac.	4
Washington:				
Spokane	3,984*	1.75	None	..
Tacoma	10,713*	1.23	Crushed rock	5
Walla Walla	14,256	2.25	....	..
Yakima	2,307*	1.65‖	Conc.	4
West Virginia:				
Piedmont	11,735*	1.70‡‖	Crushed stone	4

*By contract; ‡includes grading; ‖includes base. Cost of base per sq. yd.: Davenport, Ia., 70 cts.; New Orleans, La., $1.15; Northampton, Mass., $1.25; Lakewood, O., $1.15 to $1.23; St. Bernard, O., $1.08; Salt Lake City, 44 cts.; Tacoma, Wash., $1.00.

OTHER THAN MUNICIPAL REPORTS.

In addition to the data furnished by city officials, we have received figures of amounts of several kinds of pavement laid in a number of cities, which figures are given below, together with the names of those furnishing them.

SHEET ASPHALT.

Information Furnished by the Barber Asphalt Paving Co.

	Square yards
Connecticut	
Hartford	31,445
New Haven	44,072
Illinois	
Evanston	4,120
Jacksonville	15,506
Indiana	
Elkhart	8,290
Evansville	27,724
Indianapolis	33,546
Lafayette	16,910
South Bend	50,531
Vincennes	43,600
Iowa	
Des Moines	48,084
Laurens	13,000
Mason City	52,890
Rock Rapids	30,000
Waterloo	68,864
Kansas	
Wichita	26,952
Kentucky	
Danville	5,683
Louisville	11,140
Michigan	
Niles	6,426
Missouri	
Kansas City	1,146
St. Joseph	29,060
St. Louis	18,485
Nebraska	
Central City	30,570
Grand Island	75,600
New Jersey	
Trenton	39,270
New York	
Buffalo	79,087
Rochester	810
Utica	7,200
North Carolina	
Burlington	46,000
Durham	50,000
Monroe	32,000
Ohio	
Cincinnati	7,400
Columbus	43,480
Lorain	21,000
Marion	25,901
Newark	11,100
Toledo	27,268
Washington Court H.	10,710
Oklahoma	
Oklahoma City	19,475
State Highway	6,360
Tulsa	10,260
Ontario	
Lindsay	9,000
Ottawa	19,170
Pennsylvania	
Johnstown	3,150
Williamsport	42,000
York	9,426
South Dakota	
Madison	20,000
Tennessee	
Knoxville	59,040
Maryville	40,000
Texas	
Corsicana	18,000
Dallas	1,188
Virginia	
Franklin	4,000
Wisconsin	
Green Bay	2,830
Madison	47,006
Menasha	15,600
Milwaukee	208,975
Oconto	13,000
Racine	15,658
West Allis	11,500

ASPHALTIC CONCRETE.

Information Furnished by the Barber Asphalt Paving Co.

	Square yards
Illinois	
Cicero	41,024
Joliet	37,470
Kewaunee	28,165
Springfield	9,560
Iowa	
Waterloo	31,750
Kansas	
Eldorado	21,000
Lawrence	24,000
Mississippi	
Clarksdale	33,000
Missouri	
Kansas City	7,609
St. Joseph	2,800
Nebraska	
Beatrice	9,400
New Hampshire	
Claremont	8,000
New York	
Poughkeepsie	25,000
Tarrytown	53,000
Ohio	
Akron	20,000
Columbus	27,160
Kent	9,000
Sidney	52,162
Oklahoma	
Oklahoma City	17,850
Sapulpa	27,142
Ontario	
Galt	12,700
Woodstock	4,500
Pennsylvania	
Chester	55,850
Edgeworth	14,000
South Dakota	
Huron	31,241
Texas	
Amarillo	12,000
Hereford	26,000
Virginia	
Richmond	12,000
West Virginia	
Charleston	1,400
Wisconsin	
Portage	32,600
Racine	14,663

WARRENITE.

Information Furnished by Warren Bros.

	Square yards
Arkansas	
Little Rock	48,016
California	
San Pedro	2,305
Whittier	28,142
Connecticut	
Bridgeport	376,772
Danbury	8,673
New Canaan	16,156
Southington	7,384
Winchester	9,151
Massachusetts	
Amesbury	17,253
Marion	9,768
No. Easton	2,990
New Brunswick	
Moncton	8,786
New Jersey	
Asbury Park	13,488
Kearny	2,087
New Brunswick	20,088
Perth Amboy	6,541
Princeton	6,700
Ridgewood	28,275
So. Orange	1,198
New York	
Hempstead	4,255
Islip	3,607
Southampton	25,148
Ontario	
Kingston	2,800
New Hampshire	
Manchester	16,227
West Virginia	
Edgewood	2,125

BITUSTONE.

	Square yards
Arizona	
Tucson	2,081
Iowa	
Iowa City	3,960
Nova Scotia	
New Glasgow	6,377
Tennessee	
Nashville	6,215
Texas	
Austin	1,639

ENDURITE.

	Square yards
Massachusetts	
New Bedford	45,465

BITULITHIC PAVEMENT.

Information furnished by Warren Bros. Co.

	Sq. yds.
Arizona:	
Ajo	6,810
Tucson	34,473
Yuma	20,594
Arkansas:	
Little Rock	4,376
California:	
Albany	11,279
Calexico	28,020
Fresno	33,697
Mill Valley	56,376
Modesto	16,980
Redding	16,805
San Francisco	5,865
San Pedro	45,925
San Joaquin	12,595
Turlock	8,952
Woodland	27,794
Connecticut:	
So. Norwalk	6,106
Florida:	
Jacksonville	20,302
Idaho:	
Idaho Falls	10,889
Rexburg	31,000
Wallace	51,116
Iowa:	
Grundy Centre	44,149
Des Moines	140,007
Muscatine	4,080
Valley Junction	37,842
Kansas:	
Kansas City	24,417
Massachusetts:	
Boston	3,474
Brookline	1,264
Dedham	3,330
Fall River	17,373
W. Newton	340
Minnesota:	
Buhl	14,487
Michigan:	
Escanaba	21,432
Missouri:	
St. Louis	22,684
Montana:	Sq. yds.
Butte	30,007
Missoula	1,100
Roundup	22,425
New Hampshire:	
Portsmouth	3,312
New Jersey:	
Kearny	3,862
New York:	
Cooperstown	10,800
Endicott	7,560
Frankfort	23,334
Johnson City	2,146
Mohawk	1,107
New Rochelle	11,806
*Mohawk	11,135
*Utica	9,308
*Camden	14,042
Rochester	7,136
Rome	11,724
Troy	5,310
Yonkers	33,578

*Partly by New York State Highway Dept.

	Sq. yds.
North Carolina:	
Albemarle	12,407
Lenoir	6,740
Rocky Mount	15,756
Wilson	22,212
Ohio:	
Bexley	6,328
Canton	478
Hudson	3,170
Oregon:	
Astoria	15,689
Pendleton	24,175
Portland	40,060
Pennsylvania:	
Altoona	10,767
So. Bethlehem	17,646
Rhode Island:	
Manville	1,326
Tennessee:	
Nashville	13,775
Texas:	
Dallas	55,318
El Paso	254,197
Ft. Worth	408
Galveston	17,535
Waco	24,932
Washington:	
Camas	32,086
Sprague	14,808
Sunnyside	28,778
N. Yakima	2,455
Wapato	898
Woodburn	7,910
Wisconsin:	
Elkhorn	11,464
Waupun	45,879
Wyoming:	
Casper	28,376
Sheridan	24,260

ASPHALT MACADAM.

Information Furnished by the Barber Asphalt Paving Co.

	Square yards
New York	
Little Falls	2,800
Manhasset, L. I.	6,500
North Hempstead, L. I.	8,360
Oyster Bay, L. I.	12,000
St. Johnsville	12,000
Ohio	
Hamilton	15,215
Oklahoma	
Durant	12,240
Pennsylvania	
Birdsboro	16,000
Texas	
Terrell	20,587
Virginia	
Chase City	11,000

(Continued on page 148.)

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Change of Address.

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Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PAVING DONE BY CITIES IN 1917.

In this issue we publish our annual review of city paving done during the year 1917, together with information concerning certain features of the work, such as character of foundation, kind of filler, use of expansion joints, cost, etc. The number of cities reporting is smaller than in normal times, but it seems probable that the percentage which the work reported is of all that was done is about the same as in previous years, or about two-thirds.

As we have stated in connection with previous annual statistics, there never has been a complete statement of all municipal paving and we question whether such a statement will ever be possible. The federal government has no power to require city officials to report figures of this kind. Those received by us were furnished only by the courtesy and kindness of the city officials. We wish to assure those who have furnished us these data that we deeply appreciate their courtesy, and feel confident that the thousands who will refer to the tables in which they are set forth will add their thanks to ours.

Of the many cities that are not represented in the tables, most, we believe, did little or no paving work last year. Several officials apologized for not sending data, explaining that the amount done was so small that they did not wish to have it made public, while several score reported that no work at all was done last year.

Without attempting to make an exact comparison city by city, the general totals seem to indicate that the amount of city paving done during 1917 was about two-thirds as great as in 1916. The decrease was greater with some classes of pavements than with others, but there seem to be no striking changes in the relative popularity of the several kinds, nor any new radical developments in paving practice that have found their way into general use.

Even more interesting, probably, than the yardage laid, are the descriptions of certain details of construction, such as thickness, proportioning of materials, use of reinforcement and of expansion joints in concrete pavements, thickness of base and kind of filler used for block pavements, and other features. In order to give to the cost figures as much value as possible, we have given as much information as seemed practicable and obtainable concerning just what was included in each case in calculating cost—whether base, excavation, curbs, etc., were or were not so included.

PAVING WORK FOR 1918.

The question which is perhaps interesting those having charge of street and highway paving more than any other at the present time is the extent to which they are justified in endeavoring to carry on pavement construction during the year 1918, in view of the duty of all patriotic citizens to conserve material, labor and money, and also in view of the high prices which all of these will undoubtedly bring this year. As described in our account of the convention of the American Road Builders' Association, this subject is one that occupied much of the time and interest of the convention and was discussed more or less at length in a number of the papers read. One of these, especially, of which quite an extensive abstract is given in this issue, was devoted to an effort to answer the first of these questions, viz.: to what extent public officials would be justified by war conditions in carrying out pavement construction?

We believe that there is no tendency to dispute, either in Washington or elsewhere, the general proposition that there is urgent need for first class hard-surface pavement on all highways which will aid any traffic that is essential or helpful to the conduct of the war. The difficulty lies in deciding for each particular case whether it comes in this category, and which of the many highways under consideration are deserving first consideration from this point of view.

It was suggested by one speaker on this subject that each official, whether city, county or state, who has charge of highway construction, make a list of all highways the paving of which is being considered, arranging them in the order of priority, based entirely upon the consideration of the value of such paving to the prosecution of the war. This having been done, a list of those considered most desirable, arranged in order of priority and accompanied by the reasons for the classification, would be submitted to the Highways Transport Committee or such federal authorities as early future Congressional action may authorize to pass upon such questions, which could then compare the lists submitted by the several cities, counties or states, and make such selection as would secure for the country at large the construction of those highways which would best serve the purpose which all now have foremost in mind.

The fear that was more or less prominent a few weeks ago, that those having charge of the transportation or finances of the country would discourage if not practically prevent any highway construction this year, has been found to be unjustified. This should not be held, however, to warrant spending of funds for construcion which serves no immediately useful purpose. For instance, one of the large cities of the country recently issued bonds for extensive construction work in connection with sewers, water works, streets and parks. A few days ago it was brought to the attention of the city authorities that it was the opinion at Washington that, while the expenditures for sewers, water works and streets were apparently warranted by the necessities of their citizens, the park work which was contemplated could be postponed until after the war without any serious detriment to anyone, and the bonds which had been issued for this purpose were recalled.

As in the case of many of the various lines of self-denial which the American people are asked to make this year, it is left largely to the patriotism of each to decide whether or not a given line of conduct will aid or hinder the country in its war program, and we believe that officials of cities and other political units who have charge of preparing highway programs can be relied upon to do so with the idea of war utility ever dominant and to use in this work that truest economy which knows how and where to spend money as well as where to save it.

SOME NEW IDEAS IN CONCRETE.

On February 8th, in a lecture before a party of state highway engineers and others interested, Prof. Duff A. Abrams of Lewis Institute discussed the theories of concrete and advanced some new ideas differing more or less from those commonly entertained. He described a method of measuring the relative size and grading of any aggregate by a function called the "fineness modulus." This modulus gives a new method of proportioning concrete which is simple and at the same time entirely scientific. By the present method of proportioning, exactly the same quantity of cement may produce a concrete in one case which is only fifty per cent as strong as could have been produced by the same amount of cement with a rational proportioning of the same aggregates. He would indicate concrete mixtures by a single ratio of cement to combined aggregate, the aggregates available to be mixed in proportions that will give the best results; for example, a 1:4 concrete instead of 1:2:3 or 1:1½:3. He considers it erroneous to fix the proportions of fine and coarse aggregate in advance and then attempt to make grading of the materials such as will give the proper combination when mixed in predetermined proportions. The proper method would be to study the characteristics of the aggregates available and then mix the fine and coarse together in those proportions which will give the best results, considering the quantity of cement to be used and the character of the work. The size and grading of sand he considers less important than is usually supposed. Many sands rejected under the present specifications would, if properly proportioned, give better concrete than is generally obtained from materials acceptable under present specifications and proportioned according to current methods. The "fineness modulus" of proportioning permits of obtaining the best results of which available materials are capable.

The detrimental effect of too much water is not generally appreciated. Failure to properly proportion water is the origin of many of the erroneous conclusions reported from concrete tests. The proper proportioning of water is of especial importance in experimental work, particularly when comparing different aggregates. Probably the most significant result from the experimental work of the Structural Materials Research Laboratory of the Lewis Institute is indicated by the conclusion that "the only advantage gained from using a coarse, well-graded aggregate is due to the fact that the concrete can be mixed with less water than is required by a finer aggregate."

Another idea advanced by Prof. Abrams is that "the accepted theory that concrete aggregate should be graded in such a way as to give minimum voids is entirely erroneous." On the other hand, the maximum strength of concrete is secured with a grading that gives a much higher percentage of voids than that corresponding to the maximum density for a given maximum size of aggregate. If the maximum size of the aggregate is increased, using a sieve analysis curve of the same form, then the strength of the concrete increases as the voids are reduced.

WAR CONFERENCE OF NEW YORK CITIES.

A call for a war conference on March 6th of officials of New York State cities and of the state has been sent out by the president of the New York State Conference of Mayors and Other City Officials, Cornelius F. Burns, mayor of Troy. The mayor, the corporation council or city attorney, head of the Department of Public Safety, city engineer, and chairman of the Local Home Defense Committee of each city are requested to attend; while among the state officials invited are Gov. Whitman, Adj. Gen. Sherrill, John Mitchell, chairman of the State Food Control Commission, state food administrator Wiggin, state highway commissioner Duffey, state health commissioner Biggs, and W. H. Knapp, chairman of the State Tax Department.

Mayor Burns outlines the purposes of the conference as follows:

"First—To learn from the state officials in what ways the city governments may and should co-operate with the state government on war problems and activities, including the equipment, care and comfort of the state's armed forces, home defense, municipal improvements, the production, conservation and control of food and fuel, the financing of new municipal activities due to the war and the conservation of public health. Second—To acquaint the state with the needs of the cities in helping to carry out the State's program. Third—To give to the new officials of the twenty-five cities which changed administrations on January 1, and to the old officials, an opportunity to meet and learn how the other cities are handling various war problems. Fourth—To acquaint the new city officials with municipal war activities."

OTHER THAN MUNICIPAL REPORTS.

(*Continued from page* 146)

ASPHALT BLOCK PAVEMENTS.

Information Furnished by the Hastings Paving Co.

	Square yards
New Jersey	
East Orange	6,126
Irvington	7,450
Jersey City	38,150
Newark	6,084
Orange	8,575
South Orange	9,235
South River	19,560
West New York	10,539
Woodbridge	30,932
New York	
Amsterdam	34,483
Bronxville	17,520
Irvington	42,744
Jamestown	1,760
Middletown	1,600
New York:	
Bronx Boro.	11,344
Brooklyn Boro.	28,321
Manhattan Boro.	6,454
Queens Boro.	12,863
Richmond Boro.	2,919
Plattsburg	2,810
Port Chester	7,001
Rochester	3,300
Yonkers	20,289
Ohio	
Cleveland	16,994
Defiance	13,036
Fostoria	2,972
Toledo	12,307
Pennsylvania	
Dorranceton	2,967
Fernwood	1,170
Hazelton	2,650
Hughestown	3,790
Hulton	2,344
Kingston	4,472
Nanticoke	9,891
Newport Township	9,059
Olyphant	5,004
Peckville	3,550
West Wyoming	11,811
District of Columbia	
Washington	23,172

GRANITE BLOCK PAVEMENT.

Information furnished by the Granite Paving Block Manufacturers' Association.

Maryland:	
Baltimore	12,000
Massachusetts:	
Boston	60,000
Chicopee	11,134
Salem	14,000
Taunton	8,000
Ohio:	
Columbus	4,700
Dayton	29,119
Vermont:	
Barre	7,250

The WEEK'S NEWS

State Highway Construction in Tennessee and Indiana—The Work of the United States Public Health Service—Milk Control in Massachusetts—Wanaque in Court Again—Water Waste Survey in Niagara Falls—No Free Utility Service in Indiana—Wage Raises for Firemen in Newark and Galveston—$25,000,000 Bond and Note Sale by New York City—City Manager Events in Morganton, N. C.; Beaufort, S. C.; Norwood, Mass.; Kalamazoo, Mich., and Aberdeen, Wash.—State Control of Local Traffic Regulations—San Francisco's Twin Peaks Tunnel Opened—The St. Louis Car Strike.

ROADS AND PAVEMENTS

$1,500,000 for Tennessee Road Building.

Nashville, Tenn.—The appropriations made recently by the Tennessee highway commission of aproximately $1,500,000 to be used in co-operation with the counties is expected to enable the commission to complete the missing links and open for all-the-year-round travel approximately 1,400 miles of through highways of national importance and at the same time provide the first of the main artery highways comprised in the state's system of highways. In addition to the appropriations, the laws passed last year guarantee an amount of not less than $25,000 to be expended in each of the other counties of the state, the money to be expended when available, but to be contracted for some time prior to December, 1921, so that every county in Tennessee will within the period mentioned receive aid from the state in the construction of state highways. The proposed system includes:

The Memphis-to-Bristol highway opens the highway across the state from northeast to southwest and connects at Bristol with a Virginia state highway leading to Washington and the east. At Memphis it connects with the Jeff Davis highway leading to New Orleans and with the Arkansas state highway leading to the west and southwest. It also connects Bristol, Knoxville, Nashville, Jackson and Memphis with the counties intervening, having a connection with each of these centers. It also provides a through road accessible to the counties adjoining.

The Dixie highway crosses the state from the northwest to the southeast, connecting Nashville and Chattanooga and the military camps in the north and with those in the southeast, and is considered of vast military importance. It also passes through a rich agricultural section and the federal authorities are already planning truck trains on this highway to market farm products.

The Chattanooga-Bristol highway forms a direct line from Washington to Birmingham and New Orleans and connects at Knoxville with the Memphis-to-Bristol and at Chattanooga with the Dixie highways. At Newport it connects with the Knoxville-Asheville highway. At Knoxville it connects with the eastern branch of the Dixie leading to Louisville and the north.

The Jeff Davis highway connects Chicago, Paducah, Memphis and New Orleans with a direct road down the Mississippi river and opens up a rich farm section.

State Highway Commission Attacked in Suit.

Indianapolis, Ind.—A suit to have declared unconstitutional the act of the legislature which created the state highway commission has been filed in court in Noblesville. Robert M. House, a wealthy farmer, appears as plaintiff in the case, and Lorenzo H. Wright, David C. Jenkins, Haines Egbert and Lewis Taylor, who compose the state highway commission; William S. Moore, engineer for the commission; Otto L. Klauss, state auditor; Uz McMurtrie, state treasurer; H. O. Cottingham, county auditor; the local board of commissioners and the Hamilton county council are made defendants. The complaint also asks for a temporary restraining order against the defendants, and is a step to prohibit them from proceeding with the construction of any of the state roads now under contemplation until the case finally is determined. It is set out in the complaint that the act of the legislature in question contravenes the constitution of the state of Indiana and the constitution of the United States, and is unconstitutional and void. It is alleged that the pretended allotment of mileage for these proposed roads is wrong, unlawful, illusory, false and misleading for the reason that it is partial and incomplete. It further is charged that the commission has prepared plans for the construction of these roads at a rate of expense of from $2,500 to $3,000 a mile,

"all to the end that said pretended apportionment may be aggregated and made cumulative and applicable only to so many miles as may and can be constructed, with the total of said apportionment at the rate of $25,000 a mile, plus an equal amount to be contributed by each of the counties affected, and particularly Hamilton county; that in Hamilton county the mileage of said affected road No. 1 is in truth and in fact twenty miles, but the apportionment therefor is at the rate of $2,500 a mile for eighteen miles, and in the aggregate the said apportionment of moneys belonging to the treasury of the state is $45,000; that this aggregate, together with a like aggregate to be contributed by Hamilton county, the two sums being a total of $90,000, is wrongfully and unlawfully to be devoted by said pretended state highway commission in carrying out the aforesaid unlawful purpose and common design of the defendants in the construction of a road extending from the Marion county line north to the town of Carmel."

Warning Signs Not Enough to Make Bridges Safe.

Utica, N. Y.—An important decision from the Appellate Division has been filed which affirms the decision made by the Court of Claims in the case of an Italian driver against the state for damages. He received an award of $600 for damages sustained when a wagon loaded with gravel which he was driving went through a bridge at Stacy Basin. The load of gravel weighed four and one-half tons and there was a sign on the bridge warning against driving over the bridge with loads in excess of two and one-half tons. The decision stated that the sign and its warning did not free the state from liability, and it was up to the state to make the bridge safe for any ordinary loads and all traffic. The driver had no choice, as there was no other bridge and he was compelled to use the bridge or lose his job.

Two States Buy Bridge.

Trenton, N. J.—New Jersey and Pennsylvania have the consent of the New Jersey public utility commission to purchase the Bridge Street (or lower Trenton) bridge of the Pennsylvania Railroad Company for $236,400. This is considered an important step in the work of the joint free bridge commission of the two states in freeing this bridge from toll. Application for approval of the negotiations for the sale of the bridge to the states was made by the Trenton Delaware Bridge Company on behalf of the Pennsylvania Railroad Company, and by John A. Campbell, president of the New Jersey Free Bridge Commission and vice-president of the joint free bridge commission of the two States. Approval of sale of the bridge carries with it approval of sale of the land that is owned by the railroad company and used as approaches to the bridge. It also carries the ferry rights in the river at this point, bought by the railroad company in 1808. The Pennsylvania utility commission has also issued its approval of the sale. The price to be paid for the bridge and approaches was fixed by the joint free bridge commission under an offer made by the Pennsylvania Railroad Company more than a year ago to sell the bridge to the states for a price to be fixed by the engineers of the joint commission.

Americans to Build Model Roads in China.

Peking, China.—At a conference held recently between the representatives in this city of the Rockefeller Foundation and the Chinese director-general of flood relief and conservancy, final arrangements were completed for the building of the proposed model highway from Peking to Tungchow. Tungchow is an important provincial town about 15 miles east of Peking. It is a great center for missionary work, and several important educational institutions are located there. The scheme of a road from Peking has been under discussion for some time, and its adoption in a practicable form at present is due to the urgent need of finding employment at this season of the year for some of the persons left destitute by the serious floods in the Province of Chirli last fall. The American Red Cross has already deposited $100,000 in a Peking bank to cover the cost of this work, and the Chinese Government has promised to deposit an equal amount shortly. A Chinese director of the work has been appointed and another Chinese—formerly technical expert of the ministry of the interior—has been made chief engineer; but close attention to the matter will be given by an American engineer, who will probably be one of those employed by the American company that is now engaged in railroad building in China. It is proposed to extend this road to Tien-tsin when additional funds are available.

SEWERAGE AND SANITATION

United States Health Service Organizes District.

Portsmouth, Va.—Approving the plan proposed by the United States Public Health Service to establish a health district here, comprised of Norfolk county and Portsmouth, the board of supervisors of the county have made an appropriation of $2,700 to carry into effect the district plan by financing the county's share until the end of the current fiscal year, June 30. Dr. George M. Converse, of the health service, who was here for several weeks working on the health district plan, addressed the board on the subject, outlining some of the details of the work, and pointing to the problems of health which are confronting this section by reason of the greatly enlarged governmental activities, and the growth in population by the influx of people from all over the country, attracted here by federal construction projects. Dr. Converse gave a general outline of what it is proposed to do to bring about the co-operation and development of the health administration of the city and county. He referred to the appearance of cerebro-spinal meningitis, and also pointed to the typhoid situation, which he declared will have to be confronted when the warm weather arrives. Mosquito work must also be undertaken here as a malaria preventive, he said.

State Wins Case on Milk Standards Control.

Boston, Mass.—The supreme court of this state recently rendered a decision favorable to the government in the case of Commonwealth v. Titcomb. This was a complaint made by the Boston health department, through the agency of the milk bureau, and charged the defendant with possession with intent to sell of milk not of good standard quality. The defendant was not a producer of milk, and contended that the milk law was unconstitutional, as it did not allow him any time to bring his milk up to standard quality, as is the case with milk producers in accordance with the law. According to this law section producers of milk are allowed twenty days to bring their milk up to the legal standard after the taking of a sample which fails to conform to the requirements of the law for milk solids and fat. After the twenty-day period, if the producer's milk is still below the legal standard, prosecution may be made. In discussing this contention of the defendant the court said in part: "This statute is assailed as being arbitrarily discriminatory in favor of the producer of milk against the seller who is not a producer, and as making an unfair and unreasonable classification, and as being violative of rights secured by the Constitution of the United States. So far as the federal constitution is concerned these contentions of the defendant seem to be disposed of adversely by the decision of St. John v. New York, 201 U. S. 633. In the statute of New York there under consideration it was said:

> "'If we could look no farther than the mere act of selling, the injustice of the law might be demonstrated, but something more must be considered. Not only the final purpose of the law must be considered, but the means of its administration—the ways it may be defeated. Legislation to be practical and efficient must regard this special purpose as well as the ultimate purpose. The ultimate purpose is that wholesome milk shall reach the consumer, and it is the conception of the law that milk below a certain strength is not wholesome, but a difference is made between milk naturally deficient and milk made so by dilution. It is not for us to say that this is not a proper difference, and regarding it the law fixes its standard by milk in the condition that it comes from the herd. It is certain that if milk starts pure from the producer it will reach the consumer pure if not tampered with on the way. To prevent such tampering the law is framed and its penalties adjusted. As the standard established can be proved in the hands of a producing vendor, he is exempt from the penalty; as it cannot certainly be proved in the hands of other vendors so as to prevent evasions of the law, such vendors are not exempt. In the one case the source of milk can be known and the tests of the statute applied; in the other case this would be impossible except in few instances.'

"The statute is not in contravention of any provision of the constitution of this commonwealth. The statute is designed to protect and promote the public health. Under present conditions of life milk is an essential article of food in almost universal use. Any statute rationally adapted to the end of securing its purity, preserving unimpaired its natural qualities and securing it from adulteration plainly is within the power of the legislature. It was said in Commonwealth v. Graustein & Co., 209 Massachusetts, 38, 42, that 'the history of milk legislation in this commonwealth shows conclusively the determination of the law-making power to protect the community from adulterated or impure milk.' The intent of the vendor has been made immaterial, the main object being to shield the public from an imposition in guise of a fluid which may look like pure milk and yet be either adulterated or skimmed, an imposition difficult of detection. Necessarily there must exist a wide distinction in the selection of appropriate means. . . . A classification of vendors of milk into those who are producers and those who are not cannot be said to rest upon an immaterial, unreasonable, or arbitrary distinction. The legislature has ample power under the constitution to enact statutes regulating conduct, based upon classifications which have some rational connection with the preservation of the public health. It may exclude some from their operation so long as such exclusion has a reasonable relation to the result to be achieved, and is not a whimsical or arbitrary selection."

Health Campaign in Extra-Cantonment Areas.

Washington, D. C.—The United States Public Health Service is at present carrying on an active campaign along sanitary lines in the areas adjacent to 28 military camps and cantonments throughout the country. Complete sanitary organizations, composed of personnel supplied by the Public Health Service, the American Red Cross, and state and local health authorities, are at work in these areas for the purpose of preventing the spread of disease from the civilian population to military forces, and to protect the civil populations from communicable diseases where they have occurred among troops. The sanitary organizations include physicians, sanitary engineers, sanitary inspectors, public-health nurses, attendants and laborers. Measures undertaken include medical inspection of school children, inspection of all establishments handling food supplies, inspection of barber shops, purification of unsafe or questionable water supplies, installation of sanitary methods for the disposal of waste and drainage or filling of mosquito-breeding places. There is engaged in this work a force of approximately 440 employees of the Public Health Service, comprising 50 commissioned officers, 50 acting assistant surgeons (noncommissioned medical officers), 65 scientific and technical assistants and 75 other persons, including public-health nurses, sanitary inspectors, clerks, stenographers, laborers, etc. The Red Cross has furnished 177 scientific and technical assistants, nurses, inspectors, etc., and over 200 laborers to assist in the campaign.

National Campaign to Save 100,000 Babies.

Washington, D. C.—The country is going to celebrate the first anniversary of its entry into the war by inaugurating a "Children's Year" on April 6. The object is the saving of 100,000 lives ordinarily sacrificed to infant diseases. The plans have been announced by Miss Julia C. Lathrop, head of the Children's Bureau of the federal government. A nation-wide weighing and measurement of babies and children of pre-school age will begin April 6, to be followed up by an educational campaign, which, it is hoped, will diminish at least one-third the annual total of 300,000 preventable deaths of children of five years of age. The physical examinations will be the most comprehensive stock-taking of human resources ever attempted for the purpose of conserving human life. Co-operation in the work is promised by the women's committee of the council of national defense, headed by Dr. Anna Howard Shaw, and by the various state councils and women's organizations. The actual methods by which lives are to be saved during the twelve months' period are those whose effectiveness in saving children's lives already have been demonstrated. Briefly, they are as follows: First, immediate registration of every child born and nursing so that medical skill may be provided wherever family income does not permit its being obtained independently; second, for every mother prenatal care, necessary care of doctor and public health nurses at confinement and after care; third, children's conferences where well babies can be taken periodically to be weighed and examined, and clinics where sick children may be given medical advice; fourth, organization of state and city divisions or bureaus of child hygiene; fifth, guarding of the milk supply; sixth, an income making possible decent living standards. Each state will be assigned a quota to the extent to which it will be expected to reduce its mortality total during the children's year.

WATER SUPPLY

Court Upholds State Power on Wanaque Development.

Trenton, N. J.—The authority of the State Department of Conservation and Development to attach reasonable terms and conditions to the consent given the North Jersey District Water Supply Commission to develop the Wanaque watershed has been upheld by the Court of Errors and Appeals. The decision was an affirmation of the conclusions reached by the Supreme Court in dismissing the certiorari proceedings brought by the Society for Establishing Useful Manufactures against the Department of Conservation, the North Jersey Water Supply Commission and the city of Newark. The affirmance by the Court of Errors was based upon the opinion filed for the Supreme Court by Justice Black, September 14 last.

Newark, N. J.—The devision reached by the Errors Court caused gratification among city officials in Newark. The effect of the decision is to remove the legal barrier that has hitherto existed to the actual execution of a contract between the city and water commission for the development of the Wanaque. As matters stood prior to the rendering of this decision, the city could go only up to the point of making a contract, permission to proceed so far having been obtained from the court. However, the city commission is not yet ready to say whether it desires to proceed with negotiations leading up to the making of a contract, and is still deliberating on that point. Speculation on the part of city officials now turns to what will be the next step of the S. U. M. to prevent the Wanaque development. It has been rumored that the society would not rest satisfied with the opinion of New Jersey's highest court, but would appeal to the United States Supreme Court. On the other hand, it is pointed out, the society and its allied interests might wait until the city should enter into a contract with the water commission before starting any further litigation.

Leak Survey Saves 100,000,000 Gallons a Year.

Niagara Falls, N. Y.—The recent pitometer survey of leaky water mains has resulted in finding means to save the city more than 100,000,000 gallons this year, according to a report by city manager Carr. "Upon the completion of their survey two large meters which were running slow were called to our attention, two leaks in outside service connections, together with leaky services, which leaky connections alone, in their estimation, amounted to a loss of 102,200,000 gallons of water per year. Since that time, the meters have been corrected by the manufacturers, having been found to be running slow, one 13 per cent and the other 22 per cent. Yearly loss in water by meter 13 per cent slow—3,693,688 gallons. Yearly loss in water by meter 22 per cent slow—18,186,688 gallons. Loss in water through first service leak repaired—estimate 9,855,000 gallons. Loss in water through second service leak repaired—estimate 10,512,000. Total, 42,246,932 gallons. From the above it seems that the 33 1-3 million gallons per year which this company guaranteed to save the city has been exceeded. In addition, the leaky connections have been repaired and we are endeavoring to have the owners of property in this district entirely eliminate hopper closets and other wasteful water fixtures."

Town Takes Over Abandoned Water Plant.

Valley Park, Mo.—The town of Valley Park has begun operating "somebody's water plant" to supply the inhabitants with water, but it does not know whose plant. For several weeks the townspeople have had to carry water from the Meramec River or melt ice and snow for their needs. The water plant formerly was owned by the Valley Park Plate Glass Co., and later passed to the Missouri Plate Glass Co. When the latter went into bankruptcy last October, the receiver, W. J. Vance, who also is mayor of Valley Park, continued to operate the plant. It was found, however, that the cost of operating it with the old equipment was eating up the assets of the bankrupt company and just before the company's property was sold under a mortgage federal judge Dyer issued an order to close the water plant. The city tried to purchase the water plant, but $35,000 was asked for equipment which mayor Vance said was not worth more than $5,000. The mayor then consulted the Public Service Commission and has received a letter from that body stating that it has given no permission for transfer of the plant, as required for sale of a public utility, since it was owned by the original Valley Park Plate Glass Co. Subsequent transfers, therefore, are invalid, the mayor says, and in view of this the city will treat the plant as "abandoned."

STREET LIGHTING AND POWER

Company Withdraws Service Charge.

Napoleon, O.—Patrons of the Ohio Gas, Light and Coke Company, of this city, have been notified that they are to be permanenly relieved of a 25-cent per month readiness-to-serve-charge and refunded the 62 cents already collected. The towns affected are Napoleon, Bryan, Wauseon, Delta and Montpelier. The charge was imposed August 15, but further collections were temporarily restrained by the Fulton county court early in December. The company, in its announcement, states that it withdraws the charge rather than enter into lengthy and expensive litigation. In its stead the price of coke is to be raised.

Canada Proposes International Power Development.

Toronto, Ont.—Sir Clifford Sifton, chairman of the Canadian Conservation Commission, recently gave out the following statement regarding the power development of the St. Lawrence river: "A situation analogous to that in which Niagara power stood fifteen years ago, now exists on the St. Lawrence river. A very large development of power exists upon the St. Lawrence. There is a considerable development in the neighborhood of Montreal, but the greater portion of the power still remains undeveloped. Attempts are constantly being made to fatally complicate the position with respect to St. Lawrence power by securing the privilege of private development, which will be followed by contracts for the exportation of the power developed. I understand that the Cedar Rapids Company exports something like 60,000 h. p. per annum. An attempt was made some years ago to secure the privilege of developing the Long Sault power, the purpose being to export the greater portion of the power in the interest of a manufacturing corporation on the United States side of the line. This project was defeated largely through our efforts. A similar project is now being promoted and we are resisting it with all our energy and we trust with good prospects of success. It is almost incredible that any responsible man should be so shortsighted as to favor this project in the face of the experience which we are now undergoing at Niagara.

"The United States government is not interested in the corporations that are endeavoring to get possession of the

St. Lawrence power from the other side. Neither is the Canadian government interested in the fortunes of the gentlemen who are promoting their projects on the Canadian side. They are very few in number and their interests are confined entirely to themselves. What the United States and Canadian governments alike are interested in is that there should be a fair division of this power, that it should be developed in such a way that the neighboring and tributary population should have the use of it upon fair terms. A thorough study of the whole question inevitably leads to the conclusion that there is only one sound and satisfactory method of developing these powers, and that is by an international commission, under which the greatest and best use of the powers will be made, the most economical development will be effected, a just and equitable division of the power will take place and the governments concerned will be able to administer the power as the Hydro-Electric Power Commission administers the power of Niagara for the benefit of the people who are directly concerned in its use."

Utilities Must Abolish Free Service.

Indianapolis, Ind.—The Indiana public service commission has entered an order, denying the responsibility of the Interstate Public Service Company to continue giving free utility service of various sorts to cities and towns, wherein the company operates now under indeterminate permits from the commission. The company's former franchises from the cities and towns in question were surrendered under the provisions of the public utility act, which created the Indiana commission. The ruling is the first that has been made public on this question by the reorganized commission. The Interstate company filed petitions with the commission, asking relief from continuance of such free utility service. A recent decision from the supreme court gave the commission unquestioned authority to deny the giving of free service to a town or city, it is held, and the action just taken was in line with that decision. The towns and cities in which the free service will be discontinued follow: Monticello, Kentland, Lowell and Crown Point, all electric service; Lebanon, electric and hot water heating service; Franklin, electric, gas and water service. At Franklin, while the official designation of the utility property is the Franklin Water, Light and Power Company, the bulk of the stock of that company is owned by the Interstate Company. The commission's order held that such free service constitutes an "unjust discrimination against other consumers."

The commission has entered an order authorizing the Noblesville Heat, Light and Power Company to increase its bills for service to its patrons by the addition of a surcharge, as a wartime emergency measure of one-half cent for each kilowatt of energy furnished. The order extends to February 1, 1919. The commission has estimated that such a surcharge will bring the company about $2,500 additional revenue during the coming year. Increased costs of operation, including the increase in the price of coal, made such an addition to the revenues necessary, the hearing of the case brought out.

English Municipal Electric Plant Grows.

Sheffield, England.—The report of the electric supply department of the Sheffield city corporation for the fiscal year ended March 25, 1917, which was recently issued, shows an extraordinary development of the undertaking during that period. The plant has been largely extended at a cost of £243,725 ($1,186,088) making the capital account now stand at £2,100,272 ($10,220,976), and 8,500 kilowatts of additional generating plant is still in course of construction. The number of units sold has increased 62 per cent.—from 77,868,027 to 126,476,858; the revenue has increased 62 per cent.—from £277,580 ($1,350,843) to £450,088 ($2,190,353); the turnover of the installation and motor department has increased 50 per cent., and during the year it has installed motors representing 8,046 hosepower. The balance on the year's operations amounted to more than £95,493, of which £55,000 was transferred to the renewals and special expenditure fund, and £40,493 to special depreciation suspense account. These increases are all the more remarkable in view of the fact that the year ended March 25, 1916, showed large increases in every department over the preceding year. The average prices per unit charged during the past five years have ranged as follows: For light and heat, from 4.34 cents in 1916 to 5.52 cents in 1913; for power, from 1.42 cents in 1916 to 1.52 cents in 1913; total average, from 1.70 cents in 1917 to 2.42 cents in 1913. The total cost per unit sold during the year, including cost of production, management, rates, taxes, etc., and capital charges was 1.36 cents.

FIRE AND POLICE

$55,000 Raise for Firemen.

Newark, N. J.—According to the city budget for the year 1918, the commissioners have decided to give the majority of men in the fire department wage increases totaling $55,000 a year. The total department budget is $1,022,000. The firemen in the several grades wanted to be paid salaries that would correspond to those of policemen of similar grades. Instead of doing this the commissioners made all the raises but one a flat $100 a year.

The raises follow: 147 fourth grade firemen, from $800 to $900, total $14,700; 318 first grade firemen, from $1,300 to $1,400, total $31,800; forty-one lieutenants, from $1,400 to $1,500, total $4,100; thirty-eight captains, from $1,600 to $1,700, total $3,800; three first grade linemen, from $1,300 to $1,400, total $300; one fourth grade lineman, from $800 to $1,100, total $300; grand total, $55,000.

Thus fourth grade firemen get the same as fourth grade policemen, first grade firemen get $50 a year less than first grade policemen, fire lieutenants get $250 a year less than police sergeants and fire captains get $300 less than police lieutenants.

Fire Destroys Car Barns and Cars.

Wheeling, W. Va.—Twenty-nine cars and the west bay of the Wheeling Traction Company barns on the Wheeling Island were destroyed by an early morning fire, believed to have been incendiary. General superintendent W. B. Atwood estimated the traction company's loss at $450,000. Eleven cars were saved from the flames. A heavy wind fanned the flames, which spread rapidly. The fire started when a car man, who was lighting a car heater with oil-soaked waste, dropped the burning mass to the floor. Traffic was paralyzed on the traction company's lines for days, but every remaining car, both modern and obsolete, was pressed into service as quickly as possible. The state fire marshal's office investigated the fire at once.

Supreme Court Upholds Anti-Vice Ordinance.

Shreveport, La.—All doubt as to the legality of the Shreveport anti-vice ordinance was removed when the Louisiana state supreme court sustained the judgment of the local police court rendered several weeks ago in a test case against two women. As to the man in the case, the lower court's decision was reversed, but the main law points, those involving the constitutionality of the anti-vice ordinance, were sustained. This decision brings to a close a brief but very strenuous legal battle, which started immediately after the city council's ordinance eliminating Shreveport's vice section went into effect November 15. That very night the alleged proprietress of a vice establishment, a young woman inmate and a man were arrested on the charge of improperly using a room. The case, it was understood from the beginning, was brought for the purpose of testing the new ordinance, which was passed in accordance with an overwhelming affirmative referendum vote of the citizens as the result of an anti-vice movement inaugurated by the Shreveport Rotary Club. On the argument of the case the defense counsel contended that the city council in adopting the anti-vice ordinance exceeded its authority as granted in the municipal charter. They claimed that the council, under certain conditions, could regulate places of vice, but could not legally abolish such places. That the council lacked the authority to abolish the vice district was the particular contention of the defense. On the other hand, the prosecution, through assistant city attorney Dimick, took the position that the law gave the city the power to close up the vice area under the general welfare law. According to this contention, a vice place is a nuisance per se, and the municipality has the right always to arrest a nuisance under its general welfare provisions, the same as it would have to stop an epidemic or something else harmful to the health and peace of the community. The ordinance having been upheld, the committee, chairman Hudson of the anti-vice committee said, is in position now to go to the limit in offering its services to the authorities for the enforcement of the ordinance. Dimick said: "We had anticipated the possibility of an acquittal of the man, but it will have but little effect on the situation one way or the other, because the section of the ordinance making unlawful the keeping of assignation houses and houses of prostitution has been upheld; also the section aimed against the renting and using of rooms for immoral purposes—the person who rents the room from the keeper being the guilty one."

Police and Firemen Get More Pay.

Cheyenne, Wyo.—Policemen and firemen of this city are now receiving higher pay than they have in the past, following the reappointment of C. F. Embery as chief of police and George Bates as fire chief. The chiefs of both departments receive $125 per month under the new schedule; the fire captain and police sergeant draw $110 per month; patrolmen on the police force receive $100 per month. Firemen in the city department will receive from $80 to $100 per month, according to the recommendation of the chief and the mayor. The old administration raised the pay of the men slightly, but it was still declared to be too small. Under the new ordinance, which became effective February 1, it is believed that there will be no further difficulty in securing more good men for the police department.

Voters Approve Only Salary Raise for Police and Firemen.

Galveston, Tex.—Only one of the six proposed amendments to the charter of the city of Galveston was passed by the voters in the recent special election, that one granting authority to the board to increase the salaries of the policemen and firemen. The remaining five propositions were rejected by overwhelming majorities. The vote cast was an exceptionally light one and little interest was manifested by the voters. Less than 2,000 votes were cast throughout the city, being less than one-fourth of the qualified voters of the city. The adoption of the amendment which allows the police and fire department employees a raise in salary amounting to about $15 a month over their former salaries, carried by about two to one. The voting against the remainder of the amendments was as heavy and in some cases more so. One of the proposed changes was defeated by a vote of about 3 to 1 . This will be the last city election held for the amendment of the charter for a period of two years, the earliest possible date now being 1920. The salary raise for policemen and firemen was approved by 1,270 to 648. Other amendments proposed dealt with the fixing of salaries at higher minimums; increase of appointive power; increase in general tax rate; a bond issue for $300,000 and salary increases for city officials.

GOVERNMENT AND FINANCE

New York Sells $25,000,000 Bonds and Notes.

New York, N. Y.—The city of New York has sold $5,000,000 of revenue bills, dated January 24, maturing May 24, at an average price of 4.52 per cent. In all thirty-three bids were received, totaling $45,635,000. The successful bidders and the interest basis of each follow:

Salomon Brothers and Hutzler, $1,000,000 at 4.49 per cent.
Salomon Brothers and Hutzler, $1,000,000 at 4.51 per cent.
Salomon Brothers and Hutzler, $1,000,000 at 4.53 per cent.
Salomon Brothers and Hutzler, $720,000 at 4.55 per cent.
J. P. Morgan & Co., $1,000,000 at 4.54 per cent.
Callaway, Fish & Co., $75,000 at 4.55 per cent.
Callaway, Fish & Co., $100,000 at 4.50 per cent.
Callaway, Fish & Co., $100,000 at 4.45 per cent.
Remick, Hodges & Co., $5,000 at 4.50 per cent.

Deputy controller Arthur J. Philbin, who opened the bids, said he was well satisfied with the first offering of city revenue bills made under the new administration. He added that he regarded the price received as "most satisfactory."

A few days later deputy controller Philbin sold $20,000,000 revenue bills for the city in anticipation of tax receipts. J. P. Morgan & Co. were the successful bidders. The notes were divided into two lots of $10,000,000 each, the first lot maturing May 10 and the balance on May 20. The Morgan firm's bid for the $10,000,000 of earlier maturity was on a basis yielding 4.31 per cent and the other block commanded a price netting 4.32. The sale brough the city a somewhat better price than the $5,000,000 notes sold on January 24, when the interest basis was 4.52 per cent. Many bids were received for smaller rates of interest than those contained in the Morgan bid, the sum total of all bids received averaging an interest rate of 4.328 per cent. The lowest bidder was Salomon Brothers & Hutzler, who offered to take $150,000 of the total amount on a 4.25 per cent basis. In announcing the successful bidder controller Craig said there were forty-six bids, most of which were "all or none" bids, and that they totaled $146,488,000.

Morganton Has New Town Manager.

Morganton, N. C.—W. R. Patton has been appointed to succeed town manager Cain in that position. His salary is $1,500 a year. Morganton was one of the first three cities to adopt the commission-manager form of charter.

Woman Acts as City Manager.

Beaufort, S. C.—A woman is at present holding the office of city manager in this city. City manager H. G. Otis has been "promoted" to the managership of Auburn, Me., where he has assumed his duties. The city council has designated mayor E. C. Danner to act as manager until a permanent appointment is made, authorizing him to appoint an assistant to take active charge of the manager's office. He requested Mrs. H. G. Otis, wife of the resigning manager, to act in that capacity. Mrs. Otis has accepted, and is, to all practical purposes, city manager until a permanent incumbent is found.

Norwood Wants a New Town Manager.

Norwood, Mass.—The town is seeking a new town manager to take the place of Clarence A. Bingham who recently resigned to take a similar position in Waltham. Applications, containing full details regarding qualifications and experience, are being received by the clerk of the board of selectmen, Oliver J. Barr.

Kalamazoo Votes for Manager Plan.

Kalamazoo, Mich.—Kalamazoo has voted in favor of the commission-manager form of government, including proportional representation. Ten below zero weather kept qualified voters indoors to a large extent and fewer than 3,000 votes were cast. The totals showed 2,043 for the new charter and 659 against. The new charter is one of the most advanced in the country.

City Operating Department Reorganized.

San Diego.—Manager of operation Fred M. Lockwood has effected a complete reorganization of the city operating department. He has organized the various departments under him into bureaus, with a head to each bureau. Printed instructions as to the duties and functions of heads and employees of each bureau were distributed in order that the men might learn their responsibilities and to whom they are responsible. This is the first time the department has been reorganized since its creation in 1915. The manager has placed the general office in charge of chief clerk Arthur Francis, who now takes from the burden of the manager all petty matters and a great deal of the responsibility of enforcing regulations. All heads of bureaus are to report to the manager in writing through the chief clerk. The upkeep and general administration of the city hall has been placed in charge of chief janitor John Williams. Caretakers are made responsible for the conduct and condition of the public comfort stations. These are under the head of public buildings. All inspections are to be in charge of W. H. Judy, who has been made chief inspector. He has charge of building, gas, electric, boiler and water sanitation inspection. The bureau of engineering will continue in charge of city engineer George Cromwell and all engineering work will be under his supervision. A new bureau is that of mechanics in charge of master mechanic

Fred Whitmore. He has been placed in charge of all machines, owned or operated by the city, including all pumps, motors and automobiles. Heretofore the city's automobiles have been in charge of a master chauffeur. Whitmore is now responsible for their operation and repairs. He also is in charge of the city's machine shops. Sewer construction and the water distributing system have been consolidated into one bureau, with manager Lockwood as ex-officio superintendent and chief clerk Francis, assistant superintendent. This embraces all sewer and water construction. There are several divisions, each in charge of a foreman, who is to look after his respective division only. The bureau of water conservation includes the upkeep and care of the city impounding system, in charge of supervisor R. Wueste, reporting to the manager. The bureau of streets and public lands is in charge of street superintendent Murray Loop, with the extensive yards in charge of the yard clerk stationed there. The bureau of harbors remains as it is, in charge of harbormaster W. A. Mugler.

Strong Movement for City Manager.

Aberdeen, Wash.—The city council has passed an ordinance authorizing the mayor to appoint enumerators to take a census of the city. The laws of this state provide that any city having a population of 20,000 or over can become a city of the first class, and the council, believing that this city has the needed number, wishes to go up from the second class. If it is found that the city has enough population an election will be held to nominate fifteen freeholders, who will draft a charter to be submitted to the voters. There is a strong sentiment in the city at present for the election of councilmen at large and the appointment of a city manager.

TRAFFIC AND TRANSPORTATION

Open $4,000,000 Twin Peaks Transit Tunnel.

San Francisco, Cal.—Car service is now in operation through Twin Peaks tunnel. With mayor Rolph at the motor and with appropriate celebrations, the first car was operated through the tunnel to mark the opening of regular passenger service to the district east of Twin Peaks. The event is one of the most significant and important steps in the recent history of San Francisco. It means the opening to settlement of a vast area of residential lands within the bounds of the city and twenty minutes from the heart of downtown business centers. Initial work for the construction of Twin Peaks tunnel was started nearly seven years ago. At that time the rock strata of the Twin Peaks ridge was tested and steps taken toward promotion of the enterprise. When the practicability of the project was established, the question of financing came up, which was met by the formation of an assessment district. Property owners assessed themselves for $4,000,000, the cost of the 12,000-foot bore. This represented a levy on 16,000 parcels of land, owned by approximately 10,000 persons. The total acreage assessed in the west of Twin Peaks district is 4,153, while 660 acres east of Twin Peaks, including a portion of Eureka valley, bore $595,316 of the expense of the project. Construction of the tunnel was commenced in November, 1914, and completed July, 1917, one month under the time limitation of the agreement. Aside from the construction of the main bore, the contract included the construction of two underground stations, the Forest Hill and Eureka valley depots. The project represents a total expenditure of $4,250,000, including the cost of laying rails. There are already a number of residents in this new district, where lots have been subdivided to date to accommodate a population of 125,000. Assessed valuation of property in the district has advanced about $4,000,000 during the past six years. This means an added income of $92,000 per annum in taxes to the city, made possible only because of the coming of this transportation system. During the coming six years it is confidently expected that a vastly greater increase in revenue will be enjoyed because of the rapid development which will follow good transportation. Twin Peaks tunnel was constructed under the supervision of city engineer M. M. O'Shaughnessy.

St. Louis Has Five-Day Car Strike.

St. Louis, Mo.—The city was greatly relieved when the street cars of the United Railways resumed service after a complete tie-up lasting more than five days. Business was disorganized. The streets were crowded with jitneys, charging whatever the traffic would bear, and the city ran three municipal buses. Little violence marked the strike. The strikers, organized by the Amalgamated Association of Street and Electric Railway Employees of America, won their two main demands: Recognition by the company of the right of the men to organize; reinstatement of all men discharged since the first of the year. Provision is made in the agreement that the company shall not discriminate against any employee because of his membership in the union, and that any employee shall be free to join the union if he cares to do so. Within ten days the company and the union representatives will take up the question of hours, wages and working conditions. The company also pledges itself to receive committees from the organization at any time upon reasonable notice.

STREET CLEANING AND REFUSE DISPOSAL

Food Conservation Reduces Garbage.

New Orleans, La.—Proof that the women of New Orleans were serious when they pledged themselves to conserve food was furnished by the garbage report for January, 1918, submitted to commissioner Lafaye by Joseph A. Gleason, deputy commissioner in charge of the department of public works. In January, 1917, there were 7,694 tons of garbage collected, while in January, 1918, there were 7,416 tons collected, a difference of 248 tons. In January, 1917, there were 15,388 loads of garbage collected, as compared to 14,892 loans in January, 1918, a difference of 496 loads.

Mayor Proclaims "Snow Removal Day."

Harrisburg, Pa.—Monday, February 4, was declared "Snow Removal Day" in a proclamation issued by mayor Keister, calling upon citizens to get out with snow shovels, trucks and teams to make the streets passable for traffic. The fire hazard was one of the chief things that led the mayor to issue the proclamation. All of the narrow streets of the city where there are pavements on both sides were impassable to fire apparatus. A recent fire was extinguished only by one out of five motor trucks which was lucky enough not to stick in the drifts. The highway department because of the shortage of men and trucks was unable to cope with the unprecedented conditions. When men could be secured enough vehicles to move the snow could not be obtained. The appropriations for the moving of snow that in former winters would have been more than sufficient was long since used. Five thousand dollars has been taken from the street cleaning fund and appropriated to the snow moving job. The mayor's proclamation said:

> Harrisburg's streets are snowbound to a degree never before known in the history of the city.
>
> Car service has been disrupted; coal deliveries are made almost impossible; traffic in general is almost impossible.
>
> In front of almost every home, extending nearly to the center of the streets, are snowbanks from six to twelve feet high.
>
> In view of these unprecedented conditions, I, as Mayor of the City, do hereby proclaim Monday, February 4—which the Federal Fuel Administration makes a public holiday—as Snow Removal Day in Harrisburg.
>
> I hereby call upon all men and boys, not otherwise employed on Monday, February 4, to be ready with snow shovels to clear the streets insofar as possible.
>
> I further make public request of business concerns to donate trucks and teams to tho work of removing the snow.
>
> With motor trucks and teams on all the city streets, and with hundreds of men and boys ready to remove the snow, in a single day the city's streets can be made safe for traffic.
>
> All owners of teams or trucks who are willing to use them Monday for this public-spirited civic work should immediately notify the office of the City Highway Department. This department will route the teams and City Commissioner William H. Lynch will supervise the work.
>
> Public announcement of the routes and hours on which teams will be on certain streets will bo made Saturday afternoon.
>
> Trusting that we can count upon every business house and every citizen to do their duty, we urge every Harrisburger to help make Snow Removal Day in Harrisburg a completo success.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

Feb. 18-21.—ROAD SUPERINTENDENTS AND ENGINEERS OF ONTARIO. Annual conference on road construction, Toronto, Ont. W. A. McLean, deputy minister, Dept. of Public Highways, Toronto, Ont.

Feb. 20.—CAROLINA ASSOCIATION OF HIGHWAY ENGINEERS. First meeting, Chapel Hill, N. C. Secretary, N. S. Mullican, county highway engineer, Lexington, N. C.

Feb. 21, 22.—NORTH DAKOTA SOCIETY OF ENGINEERS. Tenth annual convention, Fargo, N. D. President, J. A. Ingram, Grand Forks.

Feb. 21-23.—NATIONAL SOCIETY FOR THE PROMOTION OF INDUSTRIAL EDUCATION. Eleventh annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa. Ass't secretary, May Allison, 140 West 42d street, New York, N. Y.

Feb. 22.—MINNESOTA JOINT ENGINEERING BOARD. Annual meeting, Duluth, Minn.

Feb. 22.—MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention, Duluth, Minn.

March 13.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington. Secretary-treasurer, Geo. A. Reed, Montpelier, Vt.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Lincoln Highway Association.

The annual meeting of the officers and directors of the Lincoln Highway Association was recently held in Detroit. Without a dissenting voice it was decided to increase and carry on the Lincoln Highway work as a means of first importance in furthering highway construction throughout the country by means of the Lincoln Highway as the great object lesson road and backbone of a real system of national highways.

Since the organization of the Lincoln Highway Association in 1913 Henry B. Joy has been president and actively in touch with each of the many constructive endeavors of the national body. Upon the entry of the United States into the war Mr. Joy accepted a commission in the army. He expects to sail for France, where, with the rank of lieutenant-colonel, he will serve in a business administrative capacity under Pershing. As the time of his return is speculative, Mr. Joy asked that a successor be named in his place to carry on the Lincoln Highway work.

By the unanimous choice of the directors, Mr. F. A. Seiberling, president of the Goodyear Tire and Rubber Company, of Akron, Ohio, was elected to the Lincoln Highway presidency. Mr. Seiberling has been a director of the Lincoln Highway Association for the past four years, and has always taken a keen interest in the big work being conducted. He and his company have contributed a sum in excess of $100,000 for road work on the desert section of the highway in Utah.

Officers and directors of the Lincoln Highway Association are extremely optimistic concerning 1918 developments upon the road. The coming year will undoubtedly see the high mark made in constructive improvement on the Lincoln Highway. Figures available at this early date indicate that approximately $4,000,000 will be spent in actual road work.

With the exception of the presidency, no changes were made in the officers of the association. Vice-presidents Roy D. Chapin and Carl G. Fisher were re-elected, as were treasurer Emory W. Clark, secretary A. F. Bement and field secretary H. C. Ostermann.

H. F. Campbell, of Indianapolis, a founder of the Lincoln Highway Association, was elected to the board of directors of the association, and will serve on the executive committee with the following associates for the coming year: President A. F. Seiberling, vice-president Chapin, director A. Y. Gowan, director Paul Deming and secretary A. F. Bement.

Mr. Seiberling made it clear that under his direction Mr. Joy's policies would be substantially adhered to, but laid stress on the fact that the association must have a greater revenue if it was to continue and keep up with the many phases of the work developed through its success.

Under his direction an active campaign will be instituted to secure the financial support of additional "founders" from among those men and organizations in every part of the country who approve of the association's activities and see their tremendous value to the nation. Lincoln Highway founders are those individuals and organizations paying $1,000 or more a year to aid the carrying on of the work.

Pike's Peak Ocean-to-Ocean Highway Association.

The annual convention of the Pike's Peak Ocean-to-Ocean Highway Association was held Feb. 6 and 7 at St. Joseph, Mo. The meeting was called after a referendum of directors of all state divisions.

Road problems arising out of war conditions were given first place on the program for the meeting. The year 1917 has been a notable one in the development of the Pike's Peak Ocean-to-Ocean highway. It witnessed the completion of an independent alignment from New York City to San Francisco and saw substantial progress in marking, logging, mapping, advertisement and development of the great central transcontinental route—"The Appian Way of America." There are now eleven states which are completely organized for the Pike's Peak Ocean-to-Ocean Highway Association.

C. F. Adams of Chillicothe, Mo., was re-elected president of the association at the closing session. A. W. Henderson of Colorado Springs, Colo., was re-elected secretary-treasurer.

American Water Works Association.

The third and last meeting for the season of the New York section of the American Water Works Association will be held at the Park Avenue hotel on Wednesday, February 20, 1918. There will be a luncheon.

This meeting is to be devoted to a recital of experiences of the various communities, during the unprecedented cold weather of this winter. New high records for consumption have been established. Members are requested to come prepared to tell what their water consumption was last winter and compare it with this winter's record. The story of frozen services and thawing them out by electricity or otherwise, will be interesting, especially if costs are given. Each member is urged to tell his troubles and how he met them.

At this meeting a governor is to be elected, to take the place of Allen Hazen, whose term of office expires.

Canadian Society of Civil Engineers.

"Fuels of Canada" was the title of the chief address of the annual convention of the Canadian Society of Civil Engineers held in Montreal Jan. 22 and 23. The name of the organization was changed to the "Engineering Institute of Canada."

The following officers were elected: President, Henry H. Vaughan, Montreal; vice-presidents, T. H. White, Vancouver; J. M. R. Fairbairn, Montreal; Prof. H. E. T. Haultain, University of Toronto; R. F. Hayward, Vancouver.

New England Water Works Association.

The February meeting of the New England Water Works Association was held at the Hotel Brunswick, Copley Square, Boston, Mass., on Feb. 13. There was a discussion of "Tentative Specifications for Cast Iron Pipe and Specials." A paper on "Steam Pumping Engines" was read by Alfred O. Doane, division engineer, metropolitan water works, Boston.

New Jersey Mosquito Extermination Society.

A five-year campaign to rid New Jersey of mosquitoes was outlined at the fifth annual meeting of the State Mosquito Extermination Association, at the Hotel Traymore, Atlantic City, held Jan. 31 and Feb. 1.

The association is urging a state appropriation of $100,000 a year for five years for the program, which has been referred to the budget committee, of which state treasurer Newton A. K. Bugbee is chairman.

The work of ridding New Jersey of the mosquito has been one-third completed, Robert E. Engle of Beach Haven, president of the Ocean County Mosquito Extermination Commission, set forth in a paper on the status of the mosquito control in the state.

Every county in New Jersey was represented at the convention. The program was opened with an address by president H. H. Brinkerhoff of Jersey City, president of the Hudson County Mosquito Extermination Commission.

Alfred Gaskill, director of the Department of Conservation and Development, delivered a paper, entitled "Mosquito Control as Prerequisite to the Urban, Agricultural and Industrial Development of New Jersey."

Frederick L. Hoffman of Newark, statistician of the Prudential Insurance Company, said that last year there were a million and a half cases and ten to twelve thousand deaths from malaria in this country. James Brooks of Glen Ridge, consulting engineer of the Essex County Mosquito Commission, told of the mosquito problem of the Upper Passaic Valley. Thomas M. Donnelly of Jersey City, Walter R. Hudson and David Young also spoke.

New Jersey has well under control the local breeds of mosquitoes, President William Edgar Darnall of Atlantic City, set forth in a report. Dr. Darnall declared that if New Jersey were free of mosquitoes it would mean an increase of property values of $500,000,000. "Such an outlook is in prospect," he said, "and it would be well worth an investment of $100,000 a year for five years."

About 100,000 acres of Jersey marsh land has been drained and there are still about 200,000 acres upon which to work. The county appropriations last year totaled $210,000 and to this sum $15,000 was added from the state. In setting forth statistics it was stated that New Jersey might be mosquitoeless at a cost of twelve cents per capita for the next five years.

Alfred Gaskill, director of the Department of Development and Conservation, with headquarters at Trenton,

(Continued on page 158.)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

A bond issue is soon to be voted on by Manchester, Kan., for the building of WATERWORKS. Plans for the improvement have been completed by the engineers, Riddle & Riddle.

The SEWAGE DISPOSAL PLANT of Forney, Tex., is to be improved. Plans and specifications for the work were prepared by the engineering firm of Myers & Noyes.

An ELECTRIC LIGHTING PLANT is to be built by Maddock, N. D. Preliminary plans are being prepared by the city's consulting engineer, W. E. Skinner.

A SEWERAGE SYSTEM and DISPOSAL PLANT are to be built by Abingdon, Va. Robert Gray is preparing plans and specifications for the work.

A WATER SUPPLY SYSTEM to cost about $600,000 is to be built by Orlando, Fla. Plans for the improvement have been completed by the J. B. McCrary Co.

Hobart, Okla., is to build a new WATER SYSTEM, including a reservoir. Plans for the work have been completed by the Byrne Engineering Company.

Milwaukee, Wis., is confronted by the problem of protecting its water mains from danger of ELECTROLYSIS. It has retained E. E. Brownell as its expert to confer with representatives of the street railway company.

Bonds for $440,000 have been voted by Globe, Ariz., for the construction of a SEWERAGE SYSTEM and the extension of the WATER SYSTEM. Plans and specifications are being prepared by the Benham Engineering Co.

Laurens, Ia., is to build sanitary SEWERS according to plans and specifications prepared by C. H. Currie.

Baxter Springs, Kan., is to construct a WATER WORKS SYSTEM to cost about $150,000. The city's consulting engineer for the work is A. C. Moore.

A SEWAGE DISPOSAL PLANT is proposed for Horton, Kan. Preliminary plans for the improvement are being prepared by Black & Veatch.

The WATERWORKS SYSTEM of Williams, Ariz., is to be improved at a cost of $55,000, the engineers, Olmsted & Gillelen having been retained to plan the work.

Sugar Bowl drainage district, Manatee county, Fla., is to make DRAINAGE IMPROVEMENTS. Plans and specifications have been prepared by the engineering firm of Cravens & Kimmel.

A new WATER SUPPLY is to be developed by Caldwell, Kans., at a cost of about $100,000. The engineering firm of Burns & McDonnell has been retained by the city to prepare plans and specifications.

Wilbarger County, Vernon, Tex., is to construct a reinforced concrete BRIDGE between it and Davidson, Okla. Plans are being prepared by the engineer, C. K. Allen, of Waddell & Sons.

In an APPRAISAL of the Pennsylvania Gas Company's property, the cities of Erie, Corry and Warren, Pa., will be represented by F. A. Shaw as their expert in a board to be composed of the city's representative, one from the company and one from the state public service commission.

PERSONALS

Figg, J. P., has resigned as superintendent of the waterworks of Savannah, Ga.

E. J. Fort, chief engineer, bureau of sewers; H. H. Schmidt, chief engineer, bureau of highways, and George W. Tillson, consulting engineer to the borough president of Brooklyn, New York City, are no longer in the city's service, their positions having been abolished.

Grubmeyer, A. C., of Baltimore, is now superintendent of the municipal electric light plant of Hagerstown, Md.

Hallock, James C., deputy chief engineer of the department of streets and public improvements of Newark, N. J., has resigned to become engineer to the republic of Ecuador, South America. Mr. Hallock has spent over seven years in Ecuador, first as engineer of the state of Esmeralda and then for five years as director general of public works for the republic. He has been connected with Newark for nearly eleven years and has had charge of a number of important problems. He had complete supervision of the development of Port Newark terminal, and of the garbage collection of the city.

Hull. H. H., formerly assistant engineer, is now city engineer of Memphis, Tenn., to succeed J. H. Weatherford.

McAndrew, William P., has been reappointed member of the city planning commission of Erie, Pa.

McStay, Arnold B., has been appointed commissioner of the department of street cleaning of New York, N. Y. He was formerly secretary of the department and later deputy commissioner.

Waite, Henry M., city manager of Dayton, O., has resigned. He is now an officer of army engineers and will have charge of rehabilitation of French and Belgian towns devastated by the war.

Weatherford, J. H., has retired from the position of city engineer of Memphis, Tenn., and opened offices as consulting engineer at 68 West Court street, in the same city. Mr. Weatherford was city engineer for over ten years, during which period almost all of the city's paved streets were improved under difficult conditions. Mr. Weatherford had charge of extensive grade crossing elimination work, the development of the separate sewer systems and the $1,500,000 North Memphis levee system. He recently submitted plans for a $500,000 water and rail terminal, with which project, it is understood, he will still be connected.

Main, William R., C. P. A., auditor of the Pennsylvania state highway department, has been commissioned a lieutenant in the United States Naval Reserve Corps, Paymaster's Department. Mr. Main secured leave of absence during the period of the war. Officals and employees of the department presented Mr. Main with a wrist watch. He was appointed auditor of the department on May 1, 1913.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

CARBURETOR ON CONCRETE MIXER.

New Device for Fuel Saving on "Northwestern" Line.

The Northwestern Steel and Iron Works, Eau Claire, Wis., is calling attention to its "Twin Service" carburetor as a new and particularly welcome feature of the 1918 equipment of its popular line of "Northwestern" mixers. This device gives the operator full control of his fuel, so that he can use either gasoline or kerosene as desired. It is claimed that this device enables a large saving in the cost of mixer fuel, and apparently is worth serious consideration in the effort to hold down production costs.

The sizes and models of mixers offered by this company for the 1918 season follow closely its line of last year. The illustration shows the end discharge mixer designed primarily for paving alleys, subways, bridge footings, etc. This model is adapted to many other uses, as it maneuvers in such close quarters that it can turn in its own length.

Special attention is called to the "fool-proof engine" and to the high sustained speed of operation—both "Northwestern" features of valuable importance in road and street work.

Five "Northwestern" mixers were used at Camp Upton, Yaphank, L. I., materially assisting to complete this—the largest camp—in record time.

The company anticipates an active season on its tile and culvert forms. The use of these, especially in road work, is effecting large savings in iron and steel as well as of railroad tonnage and car space. Another feature is the economical use of local unskilled labor.

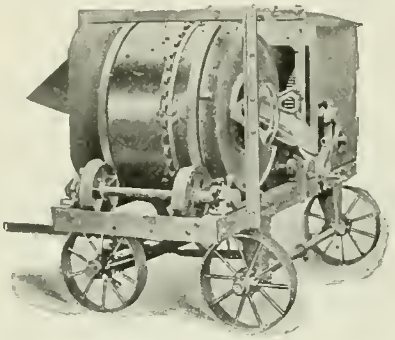
INDUSTRIAL NEWS

Cast Iron Pipe.—Prices remain constant: Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

American Concrete Pipe Association.

The annual conference and convention of the American Concrete Pipe Association was held Feb. 8 and 9 at the Hotel Sherman, Chicago, Ill., and was well-attended. The program was prepared to make the meetings valuable for bringing out ideas for increasing efficiency of the plants.

Among the papers read were: "Best Method of Curing Pipe and Tile," by Albert N. Shearman; "Bulk Cement for Concrete Tile Plants," by Willis F. Gillette; "The South as a Field for Manufacture of Concrete Drain Tile," by Edmund T. Perkins; "Bonus System," by P. H. Atwood; "Methods of Advertising," by Secretary J. H. Libberton; "The Relation of Investment, Overhead and Profit," by Frank J. Lawson; "Sewer Pipe Promotion," by Coleman Meriwether; "Sewer Pipe on Pacific Coast," by L. Y. Stayton; "Proportioning Mixtures for Concrete Pipe," by R. W. Crum.



SPECIAL END DISCHARGE "NORTHWESTERN" CONCRETE MIXER.

A luncheon, a dinner, vaudeville, etc., were the entertainment features of the well-balanced program.

The association contemplates giving greater assistance to its members during the coming year. Promotional booklets have been prepared and electros for local newspaper advertising have been set up ready for distribution in quantities at cost to all members of the association.

Serbian Need of American Products.—According to reports from the Bureau of Foreign and Domestic Commerce, immediately upon the recovery of Serbian territory now in the hands of the enemy it will be necessary to supply the remaining civilian population of that territory with relief in the shape of most necessary tools, foodstuffs, medicinal products, agricultural implements, live stock, raw materials for factories, household utensils, and the like. Before the war Serbia was largely dependent upon the central powers for these things, and while it will prove difficult for the Serbian merchants to adapt themselves to the usages of the allied markets, especially our own, a complete willingness and desire to do so is assured. American manufacturers may therefore anticipate with the liberation of captured Serbian territory a market for the following articles: Tractors, spades, picks, axes, shovels, wagons, cart axles and wheels, spray pumps, copper sulphate, pig iron, tin plate, motor trucks, chains, measuring instruments, rails, iron and steel bars, galvanized sheets, wire, lubricants, cordage, coke, calcium carbide and barges.

The Pittsburgh Wood Preserving Co., Ohio Wood Preserving Co., Michigan Wood Preserving Co., and **Acme Tie Co.** have moved their general offices to the Century building, Pittsburgh, Pa.

American Wood Preservers' Association.

The fourteenth annual meeting of the American Wood Preservers' Association was recently held in Chicago. The principal topics discussed were wood blocks for street paving and interior flooring and changes in specifications for oil for timber treatment. The following officers were elected: President, Morris K. Trumbull, vice-president, National Lumber & Creosoting Co.; vice-presidents, J. B. Card and A. R. Joyce; secretary, F. J. Angier, Baltimore & Ohio R. R., Baltimore, Md. The next meeting of the association will be held in St. Louis.

The Portland Cement Association, Chicago, Ill., announces that George A. Ricker, formerly advisory engineer and later highway engineer of the association, is now in charge of the Washington, D. C., office of the association located in the Union Trust building. Prior to joining the forces of the association, Mr. Ricker was first deputy commissioner of highways for the state of New York, which position he held from July, 1913, to December, 1914. Mr. Ricker has been identified with many engineering projects. Among others he was associated with the Pan-American Exposition, International Street Railway Co., Buffalo; served as chief engineer for the Niagara Gorge Railway Co., Buffalo, in the design and construction of the road and was consulting engineer for the Oswego Bridge Co., and for Spencer, Trask & Co., the well-known New York bankers.

The Four Wheel Drive Automobile Co., Clintonville, Wis., is executing a Government contract involving $50,000,000 for military trucks. It has declared a stock dividend of 50 per cent. The capital stock was increased from $500,000 to $1,000,000 a year ago and will be increased to $1,500,000 at once. Officers and directors were re-elected. J. D. Cotton was elected a director to fill the vacancy caused by the death of John Kalmes, treasurer.

NEWS OF THE SOCIETIES

(*Continued from page 156.*)

spoke on "Mosquito Control as a Pre-Requisite to Urban and Agriculture Development." Sanitary engineer of the Department of Health of New York, Eugene Winship, delivered an address on the "Progress of Mosquito Control." Harold Eaton, former inspector for the Atlantic County Commission, talked on the subject of the "Proper Application of Mechanics to Mosquito Control."

One of the foremost means that must be adopted to halt the ravages of the pest is to "study it on the wing," according to Dr. Thomas J. Headlee, State entomologist, who addressed the convention upon "Mosquito Distribution as a Factor in Mosquito Control." W. E. Bretton, State entomologist of Connecticut, warned the delegates not to fear "carping criticism of a skeptical world." The meeting passed a resolution, which it wired to U. S. Surgeon-General Gorgas, "respectfully suggesting the urgent necessity of a campaign to thoroughly safeguard the military forces and industrial workers against the serious risk." There were more than a hundred present at the sessions.

Robert F. Engle, of Beach Haven, president of the Ocean County Mosquito Extermination Commission, was elected president at the annual election. Other officers are: First vice-president, Walter R. Hudson, of Paterson; second vice-president, A. J. Rider, of Hammonton; secretary-treasurer, Thomas R. Headlee, of New Brunswick; executive committee, Jos. Camp, Pierces, Uric Dahlgren, Princeton, Ralph H. Hunt, East Orange, Dr. William Edgar Darnall, Atlantic City, Dr. William Williams, Rutherford, and General H. H. Brinkerhoff, of Jersey City. Atlantic City will probably get the next convention of the association.

Ohio Engineering Society.

The following are new officers of the Ohio Engineering Society: President, Dean Thomas J. Lowell, Ada; vice-president, Ed. S. Smith, Youngstown; secretary-treasurer, John Laylin, Norwalk; trustees, A. R. Taylor, Findlay; W. C. Fawcett, C. E. Fawcett, C. E. Sherman and C. T. Morris, Columbus, and Harwood Lersch, Washington.

Kansas Engineering Society.

The Kansas Engineering Society recently held its tenth annual convention at the University of Kansas, at Lawrence, in two three-session days. Nearly a hundred engineers were present. Con Buck, vice-president of the society, opened the meetings in the absence of president H. B. Walker, of Manhattan.

The committee on paving reported, with particular reference to the service of brick, bituminous concrete and concrete. Professor F. E. Johnson, of the university engineering school, described the developments of the electrical utilities of the state. N. T. Veatch spoke on sewerage problems. J. C. Wonders, district engineer for the department of agriculture, with offices in Omaha, Nebraska, discussed federal aid in road building in Kansas and told of eleven road projects that are being put under way in the state. In another talk on this W. S. Gearhart, state highway engineer, urged that road building be carried forward during the war, except at harvest time, when the road building forces should be diverted to the fields. Professor H. A. Rice, of K. U. school of engineering, made a report of the study of the state water commission on flood and drainage problems. Officers elected at the closing sessions were Con M. Buck, of Topeka, president; Dean A. A. Potter, of the state agricultural college of Manhattan, vice-president, and L. B. Smith, of Topeka, secretary.

Association of Ohio Technical Societies.

Vigorous efforts to meet the need of unity among the engineering profession in the state resulted in the permanent organization of the Association of Ohio Technical Societies at a meeting held in Columbus Jan. 29. Every local society and local section of national societies but one was represented at the meeting. The Columbus chapter of the American Institute of Architects urged that it would be to the mutual advantage of engineers and architects if each profession made use of the experience of the other. The twenty delegates passed resolutions indorsing the "ten cardinal principles" of the committee on engineering co-operation; indorsing the Cleveland Engineering Society committee's plan of requiring membership in a local society as prerequisite to admittance in a national society; and urging that local societies work for the appointing of at least one engineer to any public board where engineering experience would be of service. State regulation of engineering practice by statutes prepared by engineers was urged.

Clyde T. Morris, professor of civil engineering of Ohio State University, was chosen president and C. E. Drayer, Cleveland, secretary.

Firemen's Association of Pennsylvania.

The thousands of firemen in the state were recently called on to aid national, state and municipal authorities to combat incendiaries. The call was sent out by judge Eugene C. Bonniwell, president of the Firemen's Association of Pennsylvania, to members of the organization. He asserted that the firemen must be the keystone of the state defense against "treachery and destruction," and expressed the hope that during the present year every firehouse in Pennsylvania "shall be a beacon light of patriotism to its community, an incentive to the youth who are called to fight for our flag and a constant monitor that thrift, food conservation, economy in fuel and a dauntless courage."

For that purpose Pennsylvania has been divided into seventeen districts, with the ablest fireman in each appointed as chairman. His duty will be to organize the fire companies within the district into a close-knit association for "mutual support, the detection of incendiarism and the improvement of conditions about factories and plants, as well as to aid in the sale of Liberty Bonds and thrift stamps." Each fireman also is urged to make it his duty to wear, besides the insignia of the association, his Red Cross emblem. If not already a member, he is asked to join immediately.

Highway Traffic Association of New York State.

A public meeting of the Highway Traffic Association of the State of New York will be held at the Automobile Club of America 247 W. 54th street, New York City, at 8:30 p. m., Tuesday, Feb. 19.

William S. Conning, chairman, motor truck transportation committee, Connecticut State Council of National Defense, will speak on the subject "Practical Operation of the Return Loads Bureaus of Connecticut."

Providence Engineering Society.

The February program of the Providence Engineering Society contains a number of attractive meetings: Feb. 13, Power Section, "Elimination of Fuel Wastes in Manufacturing Plants"; Feb. 20, "Water Power Development in New England," by Henry I. Harriman, of Chace & Harriman, president of the Boston Chamber of Commerce. This talk will be illustrated. Feb. 27, Municipal Engineering Section, "Electroylsis Mitigation" (illustrated and with exhibits). by James A. McKenna, city engineer's department, Providence.

March 4 will be "members' night" and will be marked by special entertainment features. Governor R. Livingston Beekman will be speaker of the evening.

Michigan Engineering Society.

Declaring that the rapid completion of trunk line highways throughout the state and nation, to be traversed by passenger autos and freight trucks, will be a vital factor in relieving freight congestion and aid in meeting distribution problems generally, Frank F. Rogers, state highway commissioner, addressing the convention of Michigan engineers, recommended no curtailment of road building programs contemplated by the counties of the state. This address was the principal feature of the convention of the Michigan Engineering Society recently held in Grand Rapids.

The following officers were elected: President, E. D. Rich, Lansing; vice-president, L. C. Smith, Lansing; secretary, W. W. Cox, Kalamazoo; treasurer, A. J. Decker, Ann Arbor; directors, R. J. Rumsey, Grand Rapids; C. W. Hubbell, Detroit, and C. T. Johnson, Ann Arbor.

Municipal Journal

Volume XLIV. NEW YORK, FEBRUARY 23, 1918 No. 8

LOS ANGELES WATER DEPARTMENT APPLIANCES

New Methods and Appliances Developed by the Department—Portable Pump and Air Compressor—Back-filling Main and Service Trenches—Cement Joints—Work Done by Department Shops.

By C. W. GEIGER.

The water department of Los Angeles, California, has introduced a number of innovations that may offer suggestions to other cities of the country.

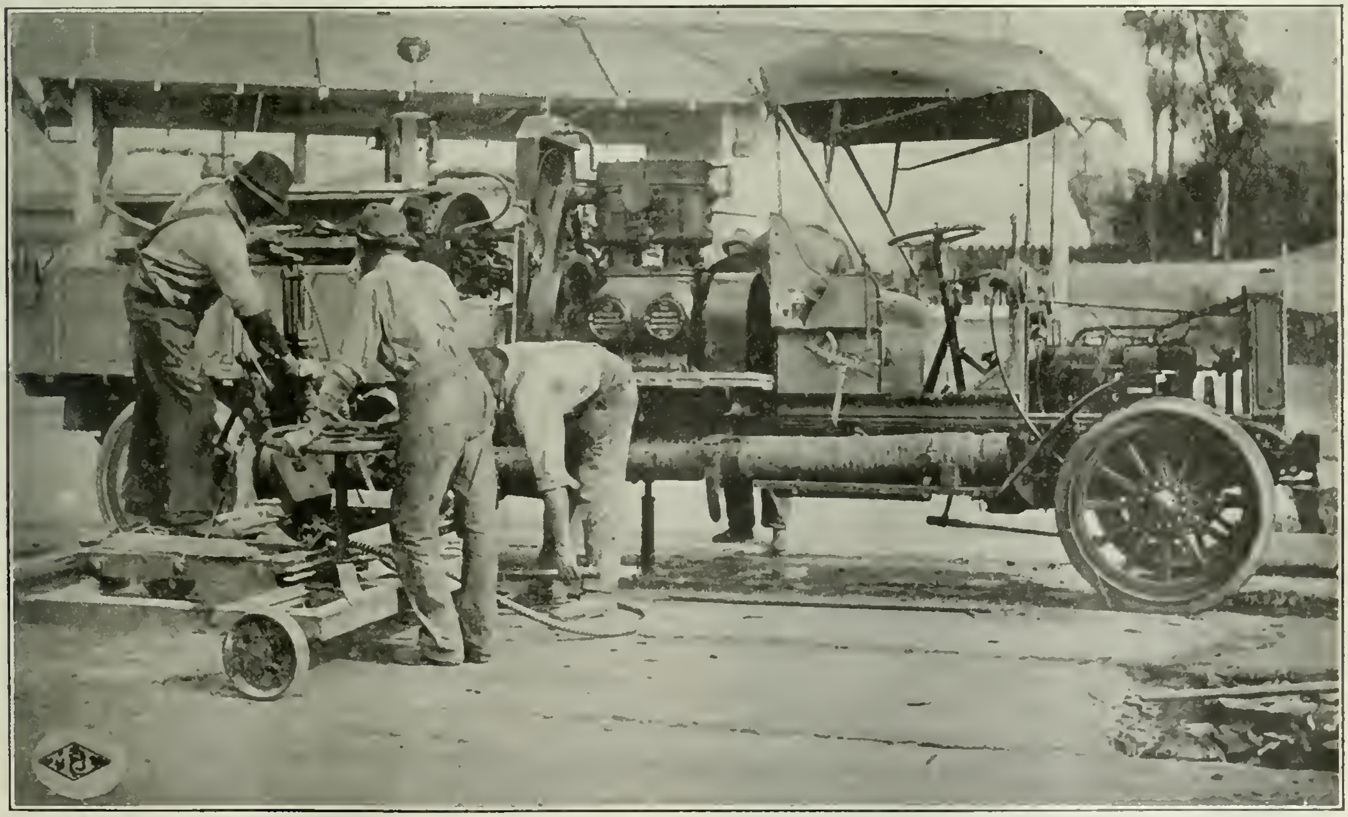
PORTABLE PUMP AND AIR COMPRESSOR.

A 2½-ton truck has been equipped with a centrifugal water pump and a powerful air compressor. Special transmission gear has been provided so that either of these can be operated by the 40 h. p. motor that operates the truck. Levers for controlling the transmission are mounted on the right side of the truck, just below the driver's seat. A 52-gallon tank is carried just back of the driver's seat on the left side of the truck, which carries a supply of water that is used to cool the engine when operating the compressor or pump.

The air compressor is cooled by means of the radiator and fan taken from an old automobile. The fan is driven by a belt running from the fly-wheel of the compressor. A speedometer is connected up with the compressor. The compressed air is stored in a large tank mounted on the rear of the truck. A working pressure of 100 lbs. is maintained in the air tank.

The centrifugal pump is mounted on the left side of the truck and has a capacity of 900 gallons per minute. It is used principally in pumping water when there is a leak or break in a main. This pump recently was used in taking care of the water coming through a 30-inch main while the main was being cut and repaired. The pump is primed by means of a small air pump mounted on the water pump, which is connected with the air tank and can be operated on as low pressure as 7 lbs.

In order to take the vibration from the automobile when the compressor or pump is in operation, a jack has



WATER DEPARTMENT'S COMBINATION POWER TRUCK AND PAVEMENT-CUTTING DRILL CAR.
Shows air compressor, tool box and air tank. The centrifugal pump is just behind the compressor. At the left foreground is the pavement-cutting car equipped with air drill for cutting out pavement.

been attached on each side of the auto frame about half way between the front and rear wheels. The jacks are hinged to the frame and when not in use they swing under the frame, but when they are to be used they are swung down to a vertical position, with their lower end resting on the ground.

Cutting Through Pavement.—The compressed air is used in calking and cutting cast-iron pipe, also for calking and riveting sheet-steel pipe. It is also used in operating an air drill which has just been built by the water department. This drill is used in cutting through asphalt, and breaking up concrete. This has proven to be not only a much more efficient method of doing this work, but is considerably cheaper and easier than the method hitherto employed. An old air-drill that had been used in the construction of the aqueduct has been mounted on a carriage which in turn is mounted on a truck. This entire apparatus can be quickly and easily dismantled and transported by motor truck from place to place. This apparatus is operated along the side of the truck on which the air-compressor is mounted. It is moved forward by means of a ratchet working on one of the wheels. The carriage to which the drill is attached is moved sideways by means of a hand wheel working a rack and pinion. The carriage can be moved sideways so that a strip four feet wide can be worked. It requires three men to operate this device; one on the ratchet to move it forward, one on the hand wheel to move the carriage sideways, and a third to start and stop the drill. A sharp bit is fastened to the drill for cutting through the asphalt. The asphalt is cut through along the two sides of the strip and can then be removed very easily. After the asphalt is removed, the truck retraces the same path, equipped with a square bit, rather heavy on the end. The drill cuts into the concrete for a depth of a half-inch to an inch, the carriage meantime being moved sideways about 6 inches, when the process is repeated. By this means the concrete for about 6 inches is broken up so that it can easily be removed with pick and shovel. The entire truck is then moved forward eight inches and the carriage is moved to the opposite side of the strip.

This device cuts through asphalt and breaks up a strip of concrete four feet wide and 120 feet long in a day. A large tool box is carried on the rear of the truck, in which are carried air-hose, bits, and other tools.

BACKFILLING TRENCHES.

In filling up long stretches of trench, a line of air pipe is laid along the trench and is connected to the air tank on the truck. (There are two of these special trucks in use now.) This air-line has connections for air hose about every 16 feet. An air hose is connected from this line to an old steam hoisting engine that has been remodeled so that it can be operated by compressed air. This remodeled hoist runs paralled with the trench. The hoist is equipped with a drum on which is wound a cable, which in turn is attached to a scraper, the scraper thus being pulled with its load of earth toward the trench. In order to keep the truck which carries the hoist from moving sideways toward the open trench, the wheels of the truck rest against a piece of pipe laid on the street and kept in place by wedges driven into the asphalt. The truck is moved forward by means of a rope and tackle which is attached to the front end of the truck and extends to the rear of the motor truck that carries the air-compressor, the free end of the rope being wrapped around a small drum on the truck.

SCRAPER USED FOR FILLING SERVICE EXCAVATION.

CEMENT JOINTS.

Cement is used to a great extent for joints of water pipe when the pipe have a solid foundation, but when they rest on ground that is not solid, lead is used for the joints. A joint in 30-inch pipe requires two-fifths of a sack of cement. Two men complete from 18 to 20 of such joints a day. When joints are made with cement, water can be turned into the pipe in 36 hours. In making cement joints, slightly moistened cement is calked in until the cement reaches the bead. Then a strand of yarn is forced in and calked. Next, dry cement mixed with a very small amount of slightly moistened cement is applied and pounded thoroughly, after which cement with more moisture is applied.

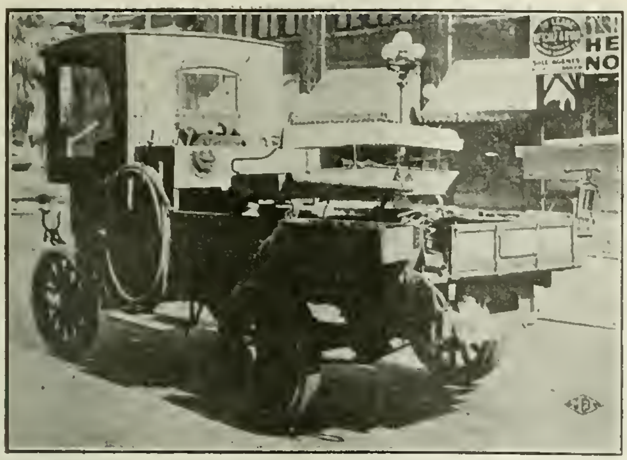
PART OF WATER DEPARTMENT YARD.

Garage at right and rear. Derrick at extreme left for handling valves and heavy castings.

PRIVATE FIRE SERVICES

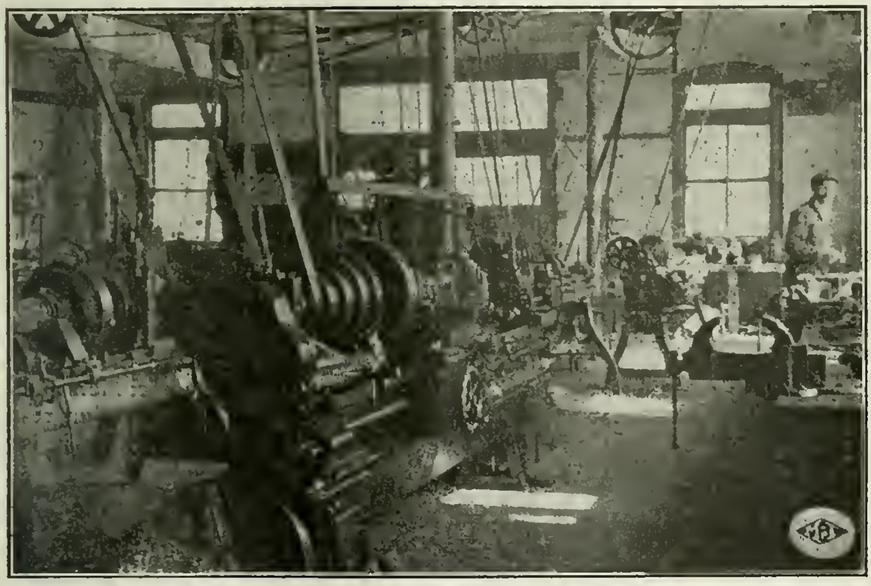
The city installs services for automatic fire-sprinkler systems at cost plus a small monthly charge. This pays for itself in six years, because of the reduction in insurance rates. Many firms are taking advantage of this at present. These services in the down-town section are usually installed on Sunday, because of the congestion of traffic during the week. A crew of five men can install a three-inch service or larger in a day.

Usually the men are tired after a day's work, and the filling in of a service trench by hand is slow and exhausting. One of the foremen conceived the idea of filling in the trench by means of a scraper made from a side panel of the motor truck used in service. An extra board is bolted onto the panel and it is connected to the front axle of the service truck by means of a cable. The driver runs the truck to the edge of the trench and as he backs up, the scraper, held by two men, scoops the earth into the trench. It has been figured that this system does the work of nine men, and the department has looked so fa-



SPECIAL BODY BUILT BY WATER DEPARTMENT.

vorably upon the idea that they have built a number of scrapers, which are now in use by all service crews.



WATER DEPARTMENT'S MACHINE SHOP, OPERATED BY ELECTRICITY.

The general shops of the water department have complete equipment for doing repair work and building new equipment. The motor trucks were equipped with the compressor and pump here. The apparatus for cutting through asphalt was built here, as well as the hoist. In addition to this, all repairs are made on the 118 automobiles used by the department. The machine shop is equipped with an auto-pit. Extending along the two sides of the lot on which the shops and store-rooms are built is a garage capable of accommodating a large number of motor cars. Gasoline, distillate, and oil are stored here. The entire lot has been paved with asphalt. A large crane in the center of the yard is used in handling all heavy equipment and supplies.

Many of the auto-trucks are equipped with bodies of special design, one of which is worthy of mention. This particular truck is designed so that it is not necessary to carry the long pipes on the outside of the body, but they are carried in one side of the truck. The end-gate is cut off about eight inches from one side of the body, allowing the long pipes to project. A piece of angle iron is bolted to the bed at the point where the end-gate is cut off. An old auto gasoline-tank has been mounted under the back part of the bed for carrying lunches for the workmen, keeping them safe and clean. On the left side, near the back, is a box which carries pipe-joints and Ts. Just back of the seat and extending across the bed is a special box for carrying jacks, water pump and valves. To the left of this are two special hooks for carrying hose, and under the body of the truck is attached a box which carries special instruments used in the work, keeping them free from jar and breakage.

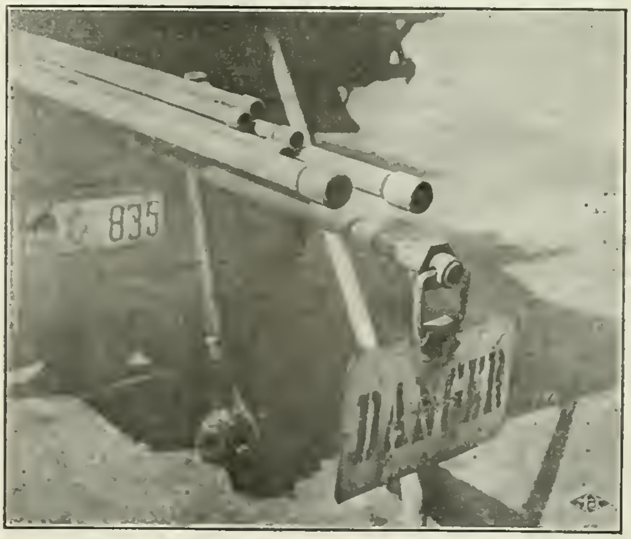
A device for carrying the danger signal has been designed which can be fastened to the end of a pipe of almost any size. The danger sign is attached to a hook, which is fastened into a union. A hole is drilled through the collar of the union and a nail is put through. The union is fastened to a 2-inch nipple which in turn is screwed into a coupling, which coupling is screwed onto the end of one of the pipes on the truck. If all the pipes are less than 2-inch, then a bushing is used in the coupling.

——Buy War Saving Stamps——

USE FOR OLD TRACINGS.

In England and in France there has for some time been urgent need of supplies of linen, muslin and other cloths from which bandages for the army can be prepared, and in this country also the necessity for these is beginning to be felt. "The Surveyor," of London, recently said: "In the offices of engineers and architects there are large numbers of obsolete drawings and tracings, cartoon maps, and diagrams mounted on calico and linen, for which there is no further use. It has been found that the muslin and calico on which these drawings are mounted, and particularly the tracing cloth, are of excellent quality, and when washed, cleaned and sterilized are most suitable for surgical work. The drawings are soaked for 24 hours and the linen stripped from the paper and then boiled and washed. The paper goes to paper makers. It is therefore a matter of great urgency that all such tracings and drawings should be turned to national use."

The idea has also been adopted to a certain extent in this country. A few weeks ago it was announced that the engineers and architects of the northwest had contributed to the Red Cross 2,500 square feet of tracing cloth for conversion into bandages. Any engineers or architects or others having old tracings which are no



DEVICE FOR CARRYING DANGER SIGNALS.

longer needed can render a service by soaking these to remove the matter used in rendering the cloth transparent, and turning the linen over to the Red Cross. Incidentally, many such individuals would be rendering themselves a service by clearing out a lot of old dust-covered tracings whose usefulness is entirely a thing of the past and which only occupy space and interfere with the orderly filing of more important plans.

——Buy War Saving Stamps——

WAR-TIME DISPOSAL OF GARBAGE*

Methods Employed in Buffalo, Cleveland, Columbus, Chicago, Milwaukee, Minneapolis, Detroit and Denver—Operation of Hog Ranch in Denver.

The committee has upon its files an abundance of tabulated data from other cities regarding the methods and the costs of the disposal of garbage and the removal of ashes and household refuse. It is not intended to go into detail at this time with regard to this information, but it is believed that the City Council is entitled to and should be informed in a general way as to the practice in some of the larger cities where the committee has made personal investigations, and the following summary is submitted for consideration:

Buffalo: Garbage and ashes are both collected by the city. The ashes are removed from the premises at a cost of approximately 78 cents a cubic yard, and this class of waste is removed to public dumps, and no revenue is derived therefrom, except of course the filling up of lands in some instances, particularly water front property, necessarily proves to be a means of increasing realty values. Other classes of refuse are hauled to a central distribution plant, where such materials as paper, rags, tin cans, metal, junk, et cetera, are sold at prices which under present conditions offset the cost of taking care of this class of refuse. The garbage is collected by the city at a cost of about $2 per cubic yard, and is delivered to a private corporation, to which an extra charge of $1 per ton is paid by the city. The garbage is then disposed of by the reduction process. The garbage is dumped into a pit, passed into conveyors, which carry the same into revolving dryers, where it is treated by heat so that the greater part of the moisture in the garbage is carried off. It then passes in a conveyor to percolating tanks, where it is treated with gasoline, where the grease is extracted and treated for commercial purposes. The garbage is then transmitted to a dryer, pressed, ground, and mixed with animal tankage, where it becomes a commercial fertilizer.

The city ordinances require the separation of refuse material into three different classes, and this the householder has to attend to himself. The three classes are as follows: Ashes, Garbage, and Refuse. The city is divided into sixteen districts for collection purposes, and about two hours before collection wagons are to arrive in a district, city truckers or rollers, so-called, go through the district for the purpose of rolling all ash, garbage, and refuse receptacles to the curb. Wagons and lifters then come along and collect the same, and after the receptacles are emptied truckers or rollers again cover the district, replacing the receptacles in the yard. This is done in every district of the city except in the business or the so-called night district, where the occupants of premises are obliged to have receptacles placed on the curb.

At the time the committee visited Buffalo the city maintained an average of thirty garbage wagons, forty refuse wagons, and forty ash wagons, and it is understood that the equipment has been motorized to some extent and that the cost of collection has been reduced considerably by reason of that fact.

Cleveland: Ashes and garbage are collected by the city, The ashes are removed by a district system, and are removed to dumping grounds, most of which are upon the lake front, and in other places where the city owns the land. The garbage is collected in specially constructed wagons, hauled to a collecting station, and there transported to a reduction plant, which is on the outskirts of the city. There, a large concrete pit, capable of holding from 250 to 300 tons of garbage, is the unloading point, from which the garbage is conveyed to tanks or digestors and thoroughly cooked. It is next pressed until it has approximately 45 per cent of moisture. It then goes into the dryers and the moisture content is still further reduced to below 5 per cent. It is then conveyed to a percolator storage room and later put into a percolator, and the grease is extracted. The grease is put into a solvent at this point, dumped into a treating tank, and the solvent is evaporated and condensed in order to recover the same. After the grease has been extracted from the solid matter, the latter is thoroughly screened, and the tankage milled and mixed with garbage stick, and again dryed and conveyed to the storehouse where it is held until disposed of to private parties for use as a fertilizer. In Cleveland some 70,000 tons of garbage are treated a year at a cost of over $2 a ton.

Columbus, Ohio: A description of and data concerning the Columbus plant was submitted in the 1916 report of the committee. By reason of the data then at hand it was generally understood and the impression was conveyed by the data that the Columbus plant was a paying proposition. Your committee learned, however, during its personal inspection of the plant and by reason of questioning of the officials in charge, that although this reduction plant is one of the best and most economically conducted in the country, the apparent revenue therefrom is entirely eliminated when the items of depreciation and interest are taken into account. Even this situation relates simply to the disposal of the garbage. after it is delivered at the plant. The collection of the garbage is a separate expense, and a direct charge against the city.

Chicago: Last year some of your committee inspected the Chicago garbage plant and found that the equipment which had been utilized for a number of years past was being discarded, and a new plant was being constructed. At that time it appeared that it would be a question of a few months only before it would be in full operation. Upon the recent inspection trip made by your committee it was found that a very small part of the new plant was being operated. Much of the machinery and considerable equipment that is to be utilized in the new plant was set up and ready for use, but the essential parts could not be obtained for the reason that the present war conditions make it impossible to have the manufacturers turn out the equipment. The construction engineer informed the members of your committee that within three weeks' time he could put the plant in motion if he could get the necessary equipment, but he was at a loss as to how soon this hope could be realized. The new Chicago plant is to consist mainly of vaporizers and percolators of a capacity of ten tons each, and a new type of Atlas dryer, by which indirect heat is to be utilized. The equipment is a very expensive one, although it is the opinion of the operating engineer that the maintenance cost over the old equipment is going to be reduced very materially.

Milwaukee: The municipality owns and operates an incinerator and collects garbage, ashes, and rubbish. In part of the city the garbage, ashes, and rubbish are collected as one unit, and burned as such. This is estimated to make a mixture of about 25 per cent ashes, 7 per cent rubbish and about 60 per cent of garbage. In the other sections of the city, the garbage and rubbish are collected separately and only the garbage is conveyed to the incinerator, the ashes being carried to the city dumps on the lake front. The ash situation is one which emphasized to the members of the committee the fact that it is not feasible or advisable for the collection of this class of rubbish from the buildings direct. In Milwaukee the teamsters enter the premises, removing barrels, but in most cases shoveling up the ashes and rubbish from cellar floors in baskets and carrying them out to the wagons. This means an expensive operation, as the city hires the outfits, requiring that each collector bring in two full loads each day. The cost of collecting ashes and rubbish, based on a cost of 65 cents a cubic yard, is over $200,000 a year, or 54.15 cents per capita. The collection of garbage is on the basis of about $3.07 per ton or a total cost of about $117,000, which means about 29.32 cents per capita.

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*Concluded from page 110.

Minneapolis: Like Milwaukee, Minneapolis operates an incinerating plant, but it is interesting in connection with the changed opinions of the members of your committee to note that the officials of that city, having been convinced of the extreme cost under the present conditions of operating the incinerator, have also set aside plans for a new reduction plant for the purpose of investigating thoroughly and with prospect of establishing a municipal piggery. The fact that the Minneapolis incinerator has had the reputation of being one of the most efficient plants of that kind in the country and that the demand for fats and fat products has prompted the officials of that city to arrange for the discontinuance of that plant, with the purpose of having the garbage fed to swine, makes a potent factor in giving serious consideration to a more general application of this form of garbage disposal. At St. Paul, Minnesota, close by Minneapolis, they are also at the present time having their garbage disposed of through the agency of a private corporation operating a piggery.

Detroit: The city hires the collection outfit for removing from private estates. The city does not collect from hotels, business blocks, manufactories, or large apartment houses, and does not enter the building. The ashes and rubbish are carted to a city dump and the privilege of picking out the salable articles nets the city a revenue of a thousand dollars a year. It costs the city from $2.07 to $5.68 per load to collect this material. Last year over $500,000 was expended for collection, and about $25,000 for leveling off at the dump. The garbage the city collects and delivers to a private contractor at the water front. The city in addition to bearing the cost of collection bears one-half of the freight charge for the transportation of the garbage to a reduction plant some twenty miles from the city. The total appropriation for 1917 for this was $216,000.

Denver: Denver, with a population about the same as Providence, handles the garbage situation by means of a contract between the city and a hog ranch corporation which has been in force for ten years, for a consideration, namely, one dollar per annum. The Denver hog ranch is given the privilege of hauling away the city's food refuse. The equipment consists of about 35 steel tank wagons of about 76 gallons capacity. Daily collections are made in the business district and twice a week in the residential districts in winter and every other day in the summer. The city ordinances require each householder to provide a covered garbage receptacle, and garbage collectors who find anything but garbage in receptacles immediately report such circumstance and the matter is dealt with by the city authorities, and in certain cases where it is repeated the resident is compelled to dispose of his own garbage.

The hog ranch is located on the outskirts of the city and consists of stables, a farrowing shed, breeding pens, fattening pens, and self-feeding devices. On the average there are about 5,000 hogs in the equipment. The farrowing shed with 500 pens is the center of the system. Each of these pens and the small outdoor outlet is floored with two-inch planks in order to promote cleanliness. The alleyways on either side of the shed separate the farrowing pens from the fattening yards, and a still further yard system is utilized for placing sows with their weanling pigs. The young pigs have garbage fed to them just as soon as they will eat, and this continues to be the basis of their diet until they reach the market size. For a while after reaching the weaning yards, alfalfa is added to the diet, and when weaned the pigs are immunized for life from hog cholera. Under State supervision extreme care is taken to eliminate the element of cholera, and everything is done to promote cleanliness and to ensure the healthy condition of the product. Special feeding devices are used and self-feeding cans are utilized. The main essential is the feeding of fresh garbage, and that is the endeavor which evidently results in the successful operation of this Denver farm.

The plant itself is estimated to represent an investment of about $35,000, and it is also estimated that the cost of the maintenance of the plant is about $25,000 a year.

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FEEDING GARBAGE TO HOGS

Discussion, at Conference on This Subject Called by United States Food Administration, by Federal Officials, Meat Packers and Others.

On December 7, 1917, the U. S. Food Administration called a meeting which was held in Chicago to obtain data in regard to the feeding of garbage to hogs. The meeting was presided over by Mr. I. S. Osborn, at that time with the Food Adminstration. Among those present at the meeting were Dr. Lester H. Howard, Commissioner of Animal Industry, and Dr. Edw. A. Cahill, Dr. O. B. Hess and Prof. W. J. Carmichael of that Bureau; George H. Shaw, F. G. Ashbrook and Dr. B. W. Murphy of the U. S. Department of Agriculture; Dr. Geo. M. Rommel, chief of the Animal Husbandry Division, and F. C. Bamman, of the U. S. Food Administration. Among those not connected with Federal departments were college professors, representatives of the packing industry and others interested. To one of these, Dr. Charles V. Chapin, health officer of Providence, R. I., we are indebted for the following information.

Before opening the discussion proper, Mr. Osborn called attention to what was being accomplished in the way of conservation by the reduction process. He said that twenty-nine cities with a total population of 17,000,000 are reducing annually 1,200,000 tons of garbage from which is obtained 70,000,000 pounds of grease and 175,000 tons of fertilizer tankage. Various subjects were discussed as follows:

Methods of Separation and Collection.—It was admitted that a good deal of extraneous material, which is injurious for feeding, is frequently put into garbage, and that much can be done by education to improve this condition, particularly if city officials are earnest in their efforts. Peter B. Gibson of St. Louis was particularly insistent on the good which could be accomplished by education. The wrapping of garbage in paper was condemned if garbage is to be used for feeding. Frequent collection in the summer is desirable in order to have fresh garbage, but once or twice a week in the winter is frequent enough from the feeders' standpoint. The distribution of garbage in large cities to a number of farmers was considered in many cases desirable but difficult to accomplish for sanitary and other reasons. Municipal collection is best, or, in place of that, a single responsible contractor. Districting a city among farmers is bad.

Garbage Feeding and Health.—Very little was said on this subject except by Dr. Chapin, who strongly urged that garbage disposal is a question of economics and comfort and scarcely affecting health at all. As regards the quality of the pork, he has never been able to find any evidence that it is unwholesome or carries disease. He has frequently eaten it himself and considers it as good as any pork. No one present said anything against the wholesomeness of garbage-fed pork.

Value of Garbage as Food.—Very few definite statements were made. Thomas Horne, superintendent of the Worcester farm, said that it cost him $2.30 per ton to dispose of garbage by feeding and that each ton of garbage yielded $7.96 cents worth of pork, leaving a net value of $5.66. Select garbage, like hotel garbage, is very much more valuable. In Worcester Mr. Horne does not get the best garbage. Mr. Gaumitz said that twenty-five pounds of hotel garbage will make a pound of pork, making the garbage worth about $12.80 a ton. Prof. John M. Evvard found that twenty-five pounds of cafeteria garbage would produce one pound of pork. Most of the speakers were agreed that, in practice, cities could not usually expect that the cost of collection could be entirely defrayed by the profits of garbage feeding, though that has sometimes been accomplished.

Market Quality of the Pork.—There was lengthy and somewhat technical discussion of this subject and as far as could be determined, by one who is not an expert, it was agreed that garbage-fed hogs, on account of their large bellies, shrink more in dressing than grain-fed animals, and hence on live weight bring a little less. Prof. Evvard said that he had had experts rate garbage-fed pork in comparison with other pork (the identity of the pork being unknown) and that the garbage-fed pork was firmer and stood higher. It was suggested that some instances of poor quality of garbage-fed pork were the result of feeding cooked garbage to animals closely confined.

Character of Feeding Plant.—There was a good deal of earnest discussion of this subject but the speakers were not always in accord. Some advocated a wide range, particularly with the larger animals, while others believed that they could be handled best in small groups, in small enclosures and with small shelters. Good shelters generally were recommended, some advising small houses and some large ones. The breeding sows should be in well lighted and heated houses. A sandy soil with good drainage is desirable. If hogs have a considerable range, they should have shade. Some advocated a place to wallow, others did not.

Methods of Feeding.—All agreed that nothing is to be gained by cooking the garbage, but on the other hand it is harmful to do this, as the animals do not do so well. Some thought it pays to use enough heat to melt the garbage in the winter, but not to cook it, though others did not think this necessary.

Most of the speakers believed that hogs do better on garbage if bred from garbage-fed animals. There was a good deal of difference of opinion as to whether animals should be fed on garbage exclusively, and it was agreed that more accurate data are needed.

Some strongly urged letting the animals feed from wooden or cement platforms. Others feed in troughs, and some are much in favor of troughs on skids which can be moved from place to place. Charles H. Knight of Louisville raises hogs on a large dumping ground to which all of the mixed garbage of the city is hauled. He claimed that the hogs do very well indeed.

Breeds of Animals.—There was general agreement that much attention should be given to the breeding of the animals. There were no reports of using pure bred hogs for utilizing garbage, but it was agreed that high-grade animals should be used. Mixtures of Yorkshires, Jerseys, Durocks, and especially Tamworths were recommended. Attention to breeding is considered one of the most important elements of success.

Diseases of Garbage-Fed Hogs.—Although tuberculosis has been alleged to be a serious menace to garbage-fed hogs, facts were presented to show that this is not so, and that tuberculosis is less common in garbage-fed animals than in animals which feed on skimmed milk, or which follow cattle. Mr. Horne said that of 100,000 pounds of pork, only fifty-one pounds had been condemned for tuberculosis. On the other hand the incidence of this disease is very high in many western animals. Figures were also presented to show that there was no excess of trichinosis in garbage-fed animals.

The greatest menace to hog raising at the present time is hog cholera. There was a great deal of technical discussion as to the nature and mode of this infection, and also as to the best methods of vaccinating against the disease. All were agreed, however, that it is entirely possible, at a moderate cost, to successfully vaccinate a herd against hog cholera so that the losses are of little moment. It was admitted that much of the vaccinating is done in a slipshod manner and is not successful. More careful Federal and State control was urged.

The general feeling of the conference seemed to be that garbage feeding is a desirable and economical means of garbage disposal. There are a large number of cities of small and moderate size where this method of disposal can be undertaken immediately. Many large cities now employing other methods may find it desirable to make a change. The profit from garbage feeding can be much increased when more is learned about the best methods of feeding, of selecting hogs, and of housing them. Much of the success in hog feeding depends upon the ability and expert knowledge of the man in charge.

——Buy War Saving Stamps——

HOG FEEDING IN WORCESTER

Arrangements at the Municipal Piggery, Where Two Thousand or More Pigs Are Kept—Pigs Clear Scrub Vegetation from Lots.

Worcester, Mass., is one of the few cities of the country which operates a municipal piggery, although the number of such promises to increase rapidly this spring. The population is about 175,000, and about 70 per cent of the garbage from the city, amounting to between 20 and 30 tons per day, is fed to pigs, which number between 2,000 and 3,000. These pigs are kept on a farm of 376 acres that is owned by the city. Garbage is collected twice a week. The haul to the farm is between ten and eighteen miles and each team generally makes only one load a day. Fish refuse and rotten eggs from markets and commission houses are not mixed with the other garbage, but are required to be placed in separate cans with tightly fitting covers, and are buried.

The garbage is fed to the pigs just as received. Washing is believed to be uneconomical because it removes considerable food material, and also to be of no advantage; and cooking or steaming makes the garbage more acid and interferes with the rejection by the pigs of substances in the garbage which are harmful to them, and which they can reject more readily than any man or machine culling could do.

The pens are cleaned out daily and the cleanings placed in a compost which is enclosed by concrete walls. These cleanings may become a nuisance by their odor, unless great care be used. After experimenting with this material, the municipal commission in charge of the piggery found that if composted in layers with an equal volume of dry top soil there was practically no offensive odor, only a musty smell remaining after ten days. As the cleanings are quite wet, it is necessary to spread them in thin layers and cover with dry soil. This composted material gives off no objectionable odor when used as fertilizer, but if uncomposted it might be the cause of considerable nuisance. In addition, it is believed that composting retains a considerable amount of valuable nitrogenous matters which would otherwise escape.

When the pigs are about six months old, they are turned into hog lots, in which are placed outdoor feeding platforms about 8 by 8 feet made of two-inch planks and mounted on skids, with half-round timber on two sides to prevent the garbage being pushed off the platform. Several of these sections are placed end to end to form one large platform. The platforms are shoveled off clean each day and the material so removed is buried or composted. When the ground around a platform has become foul with the garbage liquor and scattered garbage, the sections are skidded to another location and the ground where they previously were is plowed up. By this means the refuse trampled into the ground does not produce foul odors. About three acres of hog lot is allowed to each one hundred pigs. They are kept in these lots for about fifteen months and then are sold.

The pigs in the lots are utilized for cleaning off scrub vegetation and improving the land. They chew the bark from practically all deciduous trees, thus killing them, but coniferous trees are not touched. After removing the bark above ground, they uncover the roots and gnaw these, and even root up the smaller stumps. In about two seasons they remove all of the scrub from a lot, leaving only the larger stumps to be pulled out to make plowing possible. Most of the city's farm has been cleared in this way and made into productive farm property. In addition, it is claimed by pig growers that the scrub-bark is beneficial to the health of the pigs.

The number of pigs kept varies from time to time. When the quantity of refuse becomes less, enough pigs are sold to reduce the number to that which can be fed properly, and when the quantity of garbage increases, pigs are added to the herd. One ton of garbage will feed from one hundred to one hundred and fifty pigs, depending upon their size. About two thousand pigs are kept on the farm in winter and about three thousand to five thousand in summer.

——Buy War Saving Stamps——

TRADE WASTES IN SEWERS.

Philadelphia is planning the largest sewage treatment plant in America and, in view of the large amount of manufacturing in the city, is naturally giving the most careful consideration to the matter of the admission of trade wastes to the sewers. Concerning this, Chester E. Albright, chief engineer of the Department of Public Works, gave the following discussion in his annual report:

"It is recognized without discussion that any trade waste which will injure the structure of a sewer or interfere with the flow of sewage therein must not be admitted. Legislation already exists for the latter purpose.

"But in the cases where admission of trade wastes to the sewers increases the cost of operation of the sewage treatment works it is doubtful whether it is advisable to hamper industry by requiring treatment of the wastes at private cost within the factory in order to reduce the character of the waste to the equivalent of domestic sewage.

"While this is the procedure in many cities in England, it has a tendency to stifle industry, which thereby retards municipal growth.

"In most cases where trade wastes not harmful to sewers are produced, the deleterious effect upon a large municipal sewage treatment works can be minimized at small private expense by the installation in the factory of tanks so designed as to permit a steady, nearly uniform discharge of the trade waste into the sewer throughout the entire 24 hours of the day, instead of the discharge of large quantities in a short period of time.

"By the former method the trade waste is mingled with the sewage in such a manner as to lose its identity by the time it reaches the treatment works."

——Buy War Saving Stamps——

SERVICE STRENGTH OF SEWER PIPE

Pressures Exerted upon Pipe in Trenches by Backfilling, and Strength of Pipe to Resist Them—Conclusion from Practical Experiments.

A theory of the pressure exerted upon sewer pipes in trenches, developed from an investigation conducted by the Engineering Experiment Station of Iowa State College, and specifications of the American Society for Testing Materials based upon it, were described in the issue of Municipal Journal for October 15th, 1914. A few weeks ago the experiment station published a bulletin giving the results of research in the subject since that time. This bulletin reviews the work previously done and the former bulletin on the subject. The new matter consists chiefly of figures (derived from experiments) for coefficients in the formula, and for the actual cracking loads resisted by sewer pipes in practice. Also of recommendations concerning the testing of pipe.

The contents of the bulletin are summarized as follows:

There is urgent need at the present time for the development of a rational system of design of pipe sewers as to supporting strength, whereby sewerage engineers may be enabled to provide intelligently and adequately against danger of the cracking of sewer pipe in ditches under the loads due to or transmitted through the ditch-filling materials.

The development of a rational theory for the design of pipe sewers as to supporting strength requires the solution of three separate problems as follows:

A. The problem of developing the theory of loads on pipes in ditches, whereby loads due to ditch-filling which sewer pipe must be strong enough to carry without cracking in actual ditches may be determined in advance.

B. The problem of developing the theory of the supporting strengths of sewer pipe in actual ditches, to determine what loads due to or transmitted through ditch-filling sewer pipes can carry without cracking in actual ditches with different pipe-laying methods.

C. The problem of devising standard methods for testing the supporting strength of sewer pipe, whereby the "ordinary supporting strength," which is developed in actual ditches with the "ordinary" pipe-laying method, may be determined in advance by standard tests of sample pipe.

THEORY OF LOADS ON PIPES IN DITCHES.

The problem of developing the theory of loads on pipes in ditches has already been solved, and the solution has been published since 1913, in Bulletins No. 31 and No. 36 of the Iowa Engineering Station at Ames, Iowa. A table of safe probable maximum loads from ditch-filling materials has been adopted by the American Society for Testing Materials since 1914, in its Standard Specifications for Drain Tile.

A correct and simple formula for computing the load on pipes in ditches due to ditch-filling materials is

$W=CwB^2$,

where

W=load on pipe in ditch, in pounds per linear foot.

C=coefficient of loads on pipes in ditches.

w=weight of ditch filling material, in pounds per cubic foot.

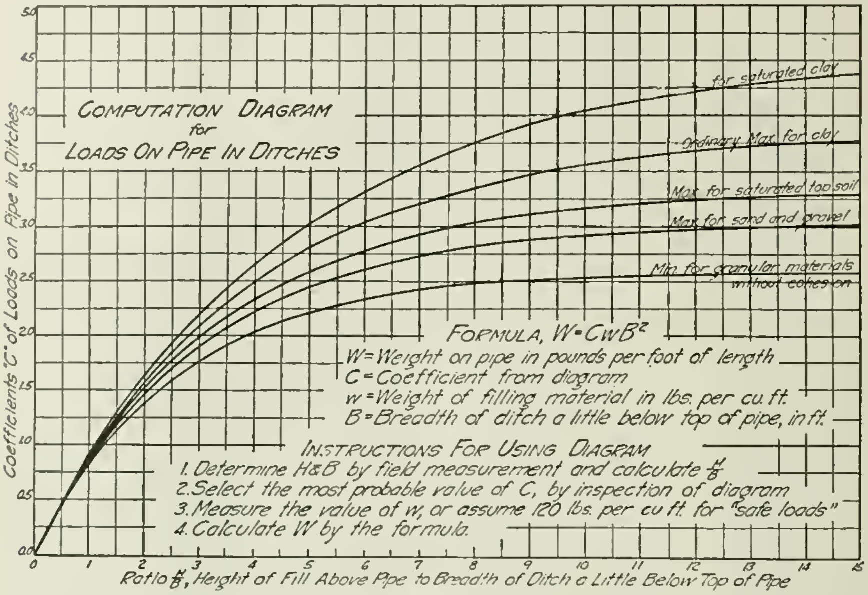

DIAGRAM GIVING VALUES FOR C IN FORMULA FOR LOADS ON PIPES IN TRENCHES.

B=breadth of ditch a little below top of pipe, in feet.

From the diagram given herewith can be obtained the coefficient needed to use in the formula to calculate safe probable maximum loads for all conditions and dimensions of ditch commonly encountered. (According to this theory the total load on the pipe is independent of the size of the pipe and also of the width of trench above the top of the pipe, but depends entirely upon the width of trench just below the top of the pipe. This is borne out by experience. For example, in one experiment two pipes of different diameters were tried successively in the same ditch, and were found to be subjected to the same load. Sewer pipe have been found cracked in the wide portions and sound in the narrow portions of the same ditch. Pipe from the same factory have been found to crack in wide ditches and remain sound in narrow ditches in the same drainage districts.)

Table II gives safe values for the probable maximum loads on pipes in ditches, due to ditch-filling materials, which are likely to occur under all conditions frequently encountered in pipe sewer construction.

The supporting strengths of sewer pipe must be enough greater than the loads to be carried to provide an adequate factor of safety to prevent cracking. Table III

TABLE NO. II.

Ordinary Maximum Loads on Pipes in Ditches from Common Ditch Filling Materials.

In Pounds per Linear Foot.

B=Breadth of ditch a little below the top of the pipe.

H=Height of fill above top of pipe.	1 Ft.	2 Ft.	3 Ft.	4 Ft.	5 Ft.	1 Ft.	2 Ft.	3 Ft.	4 Ft.	5 Ft.
	Minimum Loads Without Cohesion; Filling Material at 100 pounds per cubic foot. These loads are those commonly imposed by granular filling materials before tamping or settling.					Ordinary Maximum for Sand Filling Material at 120 pounds per cubic foot. Use these values as safe loads for sand filling in all ordinary cases.				
2 feet....	140	332	528	728	925	176	410	646	885	1125
4 feet....	204	558	938	1328	1720	267	703	1165	1636	2109
6 feet....	234	712	1255	1824	2403	313	914	1581	2271	2973
8 feet....	248	816	1498	2232	2985	338	1066	1915	2811	3729
10 feet....	254	888	1688	2570	3485	350	1175	2183	3268	4392
12 feet....	257	936	1838	2848	3918	357	1254	2399	3656	4974
14 feet....	259	969	1949	3077	4285	360	1309	2571	3985	5484
16 feet....	260	992	2039	3266	4600	364	1351	2710	4268	5928
18 feet....	260	1007	2107	3418	4870	364	1380	2821	4502	6321
20 feet....	260	1017	2159	3550	5103	364	1401	2910	4700	6663
22 feet....	260	1024	2200	3655	5300	364	1416	2982	4870	6963
24 feet....	260	1029	2230	3743	5470	364	1427	3039	5020	7227
26 feet....	260	1032	2255	3817	5618	364	1434	3086	5138	7458
28 feet....	260	1035	2275	3878	5743	364	1440	3122	5240	7659
30 feet....	260	1036	2290	3928	5850	364	1443	3151	5330	7836
Very great	260	1040	2340	4160	6498	364	1454	3273	5820	9090

	1 Ft.	2 Ft.	3 Ft.	4 Ft.	5 Ft.	1 Ft.	2 Ft.	3 Ft.	4 Ft.	5 Ft.
	Ordinary Maximum for Clay (Thoroughly Wet) Filling Material at 120 pounds per cubic foot. Use these values as safe loads for clay filling in all ordinary caees.					Extreme Maximum for Clay (Completely Saturated) Filling Material at 130 pounds per cubic foot. Use these values only for extremely unfavorable conditions.				
2 feet....	187	423	661	900	1140	210	467	726	986	1245
4 feet....	298	749	1215	1692	2166	346	841	1353	1868	2386
6 feet....	365	1000	1685	2382	3093	433	1142	1890	2658	3429
8 feet....	404	1193	2077	3000	3927	489	1383	2357	3367	4388
10 feet....	427	1343	2407	3530	4680	526	1577	2764	4000	5259
12 feet....	441	1458	2686	4000	5355	549	1733	3112	4568	6061
14 feet....	450	1547	2913	4413	5967	564	1857	3410	5080	6793
16 feet....	461	1615	3114	4775	6516	591	1957	3670	5535	7465
18 feet....	461	1668	3280	5089	7014	591	2037	3897	5940	8080
20 feet....	461	1708	3420	5374	7461	591	2102	4091	6310	8645
22 feet....	461	1740	3535	5620	7863	591	2153	4259	6636	9162
24 feet....	461	1764	3635	5836	8226	591	2195	4404	6930	9633
26 feet....	461	1783	3717	6022	8553	591	2228	4528	7191	10068
28 feet....	461	1798	3786	6192	8847	591	2254	4635	7429	10462
30 feet....	461	1808	3843	6335	9114	591	2276	4728	7640	10826
Very great	461	1845	4152	7387	11538	591	2363	5320	9450	14771

gives safe "ordinary supporting strengths" for all dimensions and other conditions of ditches commonly encountered for a safety factor of 1½.

SUPPORTING STRENGTHS DEVELOPED BY PIPES.

A knowledge of the definite supporting strength to carry loads, due to or transmitted through ditch-filling materials, which sewer pipe will develop in actual ditches with different pipe-laying methods, is essential to the rational design of pipe sewers as to supporting strength.

Extensive tests have been under way at Ames, Iowa, of the supporting strength of sewer pipe and drain tile in actual shallow ditches with different methods of pipe-laying.

Pipe-laying methods are readily separated into a few classes which may be designated "impermissible," "ordinary," "first-class," and "concrete-cradle." Only "ordinary," "first-class" and "concrete-cradle" methods require extensive attention in connection with the theory of supporting strength of sewer pipe in ditches.

The effect of differences in pipe-laying methods on the actual supporting strengths of sewer pipe in ditches is much less than was formerly supposed. Extensive laboratory tests have shown that even such extreme treatment as concentrating the entire load upon a single line over the center of the pipe (as with "three-point" bearings) decreases the cracking load only about 30 per cent of the "ordinary supporting strength."

The "ordinary" pipe-laying method is that in which the underside of the pipe is carefully bedded on soil for 60 to 90 degrees of the circumference (suitably rounding the bottom of the ditch for this purpose and digging hub holes for all pipes with hubs), and in which the pipe is surrounded by soil placed with ordinary care.

The ordinary pipe-laying method is used extensively in the construction of large tile drains and of pipe sewers in villages and small cities.

The "ordinary supporting strength" of sewer pipe is the supporting strength to carry loads due to or transmitted through ditch-filling which sewer pipe will develop in actual ditches with the "ordinary" pipe-laying method.

The "ordinary supporting strength" of sewer pipe is equal, with close approximation, to the cracking load in tests with standard "sand" bearings. This has been proven by extensive field tests at Ames, Iowa, and by extensive study of actual cases of cracked and of sound sewer pipe in actual pipe sewers.

The "ordinary supporting strength" of sewer pipe is a very important factor, on which all computations of supporting strength with different pipe-laying methods should be based, by the use of proper ratios, for the reason that in the great majority of cases of cracking of pipes in actual ditches the cracking occurs at loads just about equal to the "ordinary supporting strength" of the pipe. For the same reason, specifications of supporting strength and reports of all tests of supporting strength of sewer pipe ought to be expressed in terms of the "ordinary supporting strength."

The "first class" pipe laying method is that in which the underside of the pipe is very thoroughly bedded on soil for at least 90° of the circumference (suitably rounding the bottom of the ditch for this purpose and digging hub holes for pipe with hubs), and in which the entire pipe is surrounded with well compacted soil, all under the constant direction of a competent inspector constantly on the work.

The "first class" pipe-laying method is used exclusively in pipe sewer construction in large cities, and generally on all important pipe sewer construction under first class engineers.

The largest sewer pipe and drain tile show not more than 1/50 inch movement outwards of the extremities of their horizontal diameters under cracking loads, which is not enough to develop sufficient side resistance to affect the cracking load materially, even when the ditch filling is thoroughly tamped, as with "first class" pipe-laying. Nevertheless, all spaces around the pipe should be completely refilled with ditch filling material, for even untamped refilling between the sides of the pipe and the sides of the ditch is of great value in preventing the collapse of pipe sewers after they crack. Many miles of cracked pipe sewers and large tile drains are still rendering good service for this reason.

The supporting strength to carry loads due to or transmitted through ditch-filling which sewer pipe develop in actual ditches with the "first class" pipe-laying method may be set safely at at least 20 per cent greater than the "ordinary supporting strength" of the same pipe.

It is possible to design and build concrete cradles of

TABLE NO. III

Standard Ordinary Supporting Strengths of Sewer Pipe Required for Ordinary Sand and for Thoroughly Wet Clay Ditch Filling Materials.

Strengths in Pounds per Linear Foot

	BREADTH OF DITCH A LITTLE BELOW TOP OF PIPE																			
	1 Ft.				2 Ft.				3 Ft.				4 Ft.				5 Ft.			
	PIPE LAYING METHOD																			
Height of Fill Above Top of Pipe	Ordinary		First Class		Ordinary		First Class		Ordinary		First Class		Ordinary		First Class		Ordinary		First Class	
	DITCH FILLING MATERIAL																			
Ft.	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay
2	265	280	220	235	615	635	610	530	970	990	805	825	1330	1350	1105	1125	1690	1710	1405	1426
4	400	450	335	375	1055	1125	880	935	1745	1825	1455	1620	2455	2535	2045	2115	3166	3250	2635	2710
6	470	545	390	455	1370	1500	1140	1250	2370	2525	1975	2105	3405	3575	2840	2980	4460	4640	3716	3865
8	605	605	420	505	1600	1790	1335	1490	2875	3115	2395	2595	4216	4495	3516	3745	5595	6590	4660	4910
10	525	640	440	635	1765	2015	1470	1680	3276	3610	2730	3010	4900	6295	4085	4410	6590	7020	5490	5850
12	535	660	445	550	1880	2185	1565	1825	3600	4030	3000	3355	5485	6000	4570	5000	7460	8035	6220	6695
14	640	675	450	560	1965	2320	1635	1935	3856	4380	3215	3650	5975	6620	4980	5515	8225	8950	6855	7460
16	645	680	455	565	2025	2425	1690	2020	4065	4675	3355	3895	6395	7165	5330	5970	8890	9775	7410	8145
18	545	685	455	570	2070	2505	1725	2085	4230	4920	3525	4100	6750	7630	5625	6360	9480	10520	7900	8770
20	545	690	455	575	2100	2565	1750	2135	4365	5130	3640	4275	7050	8060	5875	6715	9995	11190	8330	9325
22	545	690	455	575	2125	2610	1770	2175	4470	5305	3725	4420	7305	8425	6090	7020	10445	11795	8705	9830
24	545	690	465	575	2140	2645	1785	2205	4560	5455	3800	4545	7525	8750	6270	7290	10840	12340	9035	10285
26	645	690	455	575	2150	2675	1795	2230	4630	5575	3855	4645	7705	9035	6420	7530	11185	12830	9326	10690
28	545	690	455	575	2160	2695	1800	2245	4685	5650	3905	4735	7860	9280	6550	7735	11490	13270	9575	11060
30	545	690	455	575	2165	2715	1805	2260	4725	5765	3940	4805	7990	9500	6660	7920	11755	13670	9795	11395
Very Great	545	690	455	575	2180	2770	1820	2310	4910	6230	4090	5190	8725	11075	7270	9230	13635	17305	11365	14425

Ordinary Pipe-Laying is pipe laying in accordance with customary good practice in tile drain construction, whereby the underside of the pipe is well bedded on soil for 60 to 90 degrees of the circumference.

First Class Pipe-Laying is pipe laying in accordance with the best customary practice in pipe sewer construction, whereby the entire underside of the pipe is very thoroughly bedded on soil and the entire pipe is surrounded by well-compacted soil, under the direction of an inspector constantly present on the work.

When pipe are laid in a Concrete or Other Permanent Masonry Cradle, strong enough to carry the entire load to the subbase without breaking and large enough to prevent materialsettlement, the standard strengths for all dimensions of ditches and all filling materials shall be those specified in the standard specifications for clay and cement sewer pipe adopted, tentatively, in June, 1917, by the American Society for Testing Materials.

reasonable cost which will increase the cracking strengths of sewer pipe under loads due to or transmitted through ditch-filling 100 per cent or more above their "ordinary supporting strength."

Variations of the dimensions and other characteristics of concrete cradles (for the same diameter of pipe and other conditions) affect the increase in supporting strength greatly. The real effects of variations can be ascertained reliably only by actual tests to destruction.

A large amount of experimental investigation of concrete cradles of different designs, tested to destruction, is needed to determine the best designs, and the real values of concrete cradles of specific designs.

The best engineers seem pretty well agreed that the use of concrete cradles in pipe laying ought to be greatly extended beyond present practice in the construction of all pipe sewers of 15 inches diameter and larger.

A study of all known cases of cracking of sewer pipe or drain tile in actual ditches, and of the detailed data of a large number of cases of sound pipe in ditches, shows that a safety factor of 1½ is both necessary and sufficient to prevent cracking.

(To be continued)

——Buy War Saving Stamps——

PHOTOGRAPHY AND BLUE PRINTING.

The Department of Public Works of Philadelphia finds that photography furnishes a better medium for showing the progress of public improvements and for obtaining publicity for the same than any other method that is known to be available. It therefore attempts to use this to its fullest capacity and has developed the service to such an extent that it has accumulated about 14,000 negatives showing various kinds of municipal improvements in all stages of progress. These negatives are kept in heavy envelopes for preservation.

Owing to the ever-increasing demand for the quick delivery of photographic prints and also of blueprints, a machine for drying photographic prints and blueprints was sometime ago recognized to be a necessity and the head of the department recommended installing a drying machine for this purpose.

Drawings are copied by means of a large photostadt, which was installed by the highway bureau for the purpose of copying plans of underground structures for use by public service corporations and others. There will be altogether about 2,500 of these plans to be copied and 317 of them had been finished at the time of the latest annual report. The size of this machine is such that it interfered with routine work in the room occupied by it and it was recommended that an additional room be obtained for it, fitted with suitable washing tanks and with appliances and conveniences for color photography, which was being contemplated.

In addition to the new appliances and the additional space required by the rapidly increasing work of the photographic division, an increased force also has become necessary, including at least two photographers, one experienced in commercial photography and the other in motion-picture work, and also a clerk to take care of and file the negatives.

While the making of municipal purchases by a department of supplies is undoubtedly to be recommended for almost every city, there are conditions connected with certain classes of purchases which should not be overlooked. One of these which has caused annoyance in connection with the work herein referred to has been the obtaining of blueprint paper. Neither the Department of Supplies nor the Department of Public Works can keep a large supply on hand on account of its rapid deterioration; while on the other hand, when the paper is wanted it is wanted without the delay too often resulting from the method of procedure of a purchasing department. It should not be difficult to overcome such a difficulty. It might be suggested, for instance, that annual contracts for such paper be let by the Department of Supplies, the paper to be delivered directly and immediately by the manufacturers to the department needing it upon presentation of an order from such department.

——Buy War Saving Stamps——

IMHOFF ROYALTIES.

The following letter has been sent by the Pacific Flush Tank Company to "all engineers and municipalities," in conformity with instructions of the Federal Trade Commission. From this letter it will be learned that the commission authorizes that company to continue to collect royalties on the Imhoff patents, as it did prior to the war.

> We beg to advise you that the Federal Trade Commission, under authority of, and in conformity with the "Trading with the Enemy Act" and with the executive order of Oct. 12, 1917, has under date of Dec. 17, 1917, exclusively licensed the Pacific Flush Tank Company to make or cause to be made, to use or cause to be used, to sell or cause to be sold, and to carry on or cause to be carried on within the United States, the inventions, processes and methods described in certain United States letters patent, employed in the disposal of sewage, under what is commercially known as the Imhoff Process and Tanks, for term of each of said patents.
>
> We are required to report to the United States Government, through the Federal Trade Commission, a detailed list of every sedimentation tank, built or contemplated, which is of the two-story or Inhoff type, and in each instance, the total population tributary, the sewage of which the tank is designed to handle.

——Buy War Saving Stamps——

NECESSARY PUBLIC WORK SHOULD BE DONE.

The sewer problem is solely one of necessity. To build the sewers allowed in this year's budget will now cost perhaps twelve million dollars, instead of eight. The Council and the Board of Estimates are weighing the necessity of these improvements against the largely increased cost, and the undesirability of public work in war time. If the necessities of Detroit are greater than the objections, the public will no doubt approve this sewer construction. On the other hand, the public can reasonably request that this necessity be proved beyond ordinary doubt, and that the improvements be made in the strict order of their necessity, without regard to the real estate interests affected.—*Detroit Bureau of Governmental Research.*

——Buy War Saving Stamps——

PUBLIC WORK AT TOLEDO.

In sending us information concerning last year's paving work, which information was given in the February 16th issue, Harry C. McClure, commissioner of engineering and construction of Toledo, stated that that city contemplated about thirty large jobs of pavement construction, some hard street construction work involving considerable concrete, and approximately ten local sewers and an intercepting sewer, together with a pumping plant. This work will cost a total of about $2,000,000 and will be constructed this year if it is found possible to obtain the necessary men and material.

——Buy War Saving Stamps——

KALISPELL BUYS LIBERTY BONDS.

The annual report for 1917 of W. H. Lawrence, superintendent of the Kalispell, Montana, Water Department, states that "By request of Mayor Pauline, the Water Department has invested from its depreciation reserve fund $10,000 in Liberty Bonds and War Saving Certificates."

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Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PIGGERIES FOR PROFIT AND PATRIOTISM.

If we may judge from the number of inquiries that have reached Municipal Journal during the past two months, there is no other one question that is so engaging the consideration of cities and towns at the present time as that of raising pigs on garbage. In view of the general interest in this subject, we are publishing this week three articles dealing with it, and expect to publish one and possibly more additional ones within the next week or two. Other articles and comments on the same subject will be found in the issues of Municipal Journal for August 9th and October 18th, 1917, and February 9th, 1918.

Garbage may also be utilized in reduction plants by which the grease is extracted and the remaining material is reduced to a form available as fertilizer. This fertilizer may be used by the farmer for growing grain, and that in turn be used for feeding hogs; but this method of utilizing would consume an additional year of time and a considerable part of the labor of the farmer, both of which would seem to be unnecessary; for the garbage, from which was prepared the fertilizer, which was used in growing the grain, which was employed in fattening the hogs, could have been used immediately and directly for this last purpose. A qualification of this statement is suggested by the query whether garbage is as desirable a food as is grain. Investigation of this problem appears to indicate that it is, provided the garbage can be fed to the hog while still fresh and comparatively free from foreign matters. In other words, if the citizens can be induced to keep out of the garbage pail materials which are not fit for hog-food, and if collections can be made with sufficient frequency and the garbage pails be kept sufficiently clean to prevent the souring of the garbage, such utilization of the kitchen refuse of the community would appear to be the most effective and probably the most economical that can be made of it.

It appears to be the opinion that garbage used for this purpose should not contain too much meat, and therefore that collections from meat markets should be kept separate from the garbage. Also, fish-market refuse is considered undesirable. There is seldom any difficulty in disposing of the former, because of the considerable amounts of grease that can be derived from it by rendering plants, while the fish refuse also is in demand by similar plants or is valuable as a fertilizer if plowed under the soil.

A precaution which must be taken by every community, if it is to prevent the early condemnation of this use of garbage by the citizens, is the taking of all pains necessary to prevent the hog-farm from becoming a nuisance because of its odors. If no such precautions are taken, such a farm may become a greater nuisance than the most neglected sewage treatment plant; while on the other hand, it is perfectly practicable, by keeping such a farm free from uncovered refuse or filth, to prevent any greater odors than those connected with a well-kept stable or other abode of animals. Simply buying a herd of pigs, putting them in charge of an old-fashioned farmer, and dumping garbage into their pens as collected, is not to be thought of for a minute; but the hog farm should be prepared for the purpose as carefully as any other manufacturing plant, and the superintendent of the same should be as well trained for his business as though he were manufacturing ammunition instead of food.

Given a properly conducted farm and adequate separation and collection of garbage, and we believe that any community, large or small, can both economize in the cost of disposing of this kind of municipal waste and at the same time place itself in the class of those who are helping their country and the Allies win the war by increasing the amount of one of the most essential foods.

——Buy War Saving Stamps——

PEACE PREPAREDNESS.

No money, labor or material that can be used in aid of the country's war aims should be used for any other purpose not immediately essential to the well-being of the people. But this does not mean that no thought should be given to other matters. War was not expected by us and we were little to blame for being unprepared for it; but peace certainly is expected, and it is our duty to be prepared for it. Germany's is essentially a military government, but it is reported that for months it has been preparing for the peace that must come some time. It probably has worked out already a plan for making swords into plowshares, an estimate of the number of these that can be turned out, and the most effective plan for distributing and using these peace implements.

Cities should not build parks now, but they can plan them. It may be necessary to postpone paving the outlying residence streets, but a peace paving program should be perfected. One of the most common shortcomings of city governments has been their failure to take sufficient foresight—to prepare programs for the future development of public improvements, using therein the best talent available, and to decide upon the annual construction programs sufficiently in advance to permit careful preparation of detail plans for the same.

This year of comparative inactivity in municipal work can be made the most profitable in the life of the public works department if utilized wisely by them in planning for the future development of the city under peace conditions.

The WEEK'S NEWS

State Highway Events in Idaho, New York and Pennsylvania—New Jersey's Interstate Connections—Great Falls Raises Water Rates—Newark Helps Jersey City in Water Shortage—Philadelphia's Share of Gas Company Receipts—Ontario Controls Natural Gas—Fires in Montreal, Bowie, Tex., and Poughkeepsie, N. Y.—New York's "Millionaire Traffic Cop"—Cause of Port Newark Terminal Fire—Debt Limit of New York City—Gallipolis, O., Has City Manager.

ROADS AND PAVEMENTS

State Has to Buy State Highway Bonds.

Boise, Idaho.—The state land board has purchased $400,000 worth of the state's highway bonds with the state's permanent school funds. The bonds bear 4½ per cent interest. Bids on the bonds had been asked for ten weeks before, but none was received. After it was known that bond purchasing houses would not bid the highway commission asked the land board to buy the bonds. Bids were advertised six weeks later. The land board was the only bidder, and bought the bonds at par. The board advanced $200,000 at once to the highway commission. Later this month it will advance another payment of $100,000, and in March the fourth payment will be made. Before war was declared the highway commission disposed of $500,000 worth of the state's road bonds to a Portland firm. A few months later it attempted to sell the second instalment of the $1,000,000 worth of bonds voted by the last legislature, but no sale was found for them. Because the constitution limits the state's indebtedness the highway commission cannot sell the remaining $100,000 worth of bonds voted by the legislature until other bonds in that sum now outstanding are retired. The state will be in a position to reduce its indebtedness in April.

New Jersey Interstate Bridge and Tunnel Legislation.

Trenton, N. J.—The three bills to advance the projects for a tunnel between Hudson county and New York City under the Hudson River and for a bridge over the Delaware River, between Camden and Philadelphia, have been passed by the state legislature and signed by governor Edge. They were administration bills. House 1, providing for the appointment of interstate commissions on bridge and tunnel, was put through after an amendment had been made by which all reference to civil service requirements for employees of the commission was stricken out. This was done because the state could exercise no jurisdiction over employees who might be chosen from other states. The action was on the suggestion of the civil service commission. The second bill prescribes the duties of the commissioners and their powers. When the third bill, the one to impose a state tax of $1 on $1,000 of ratables, was taken up assemblyman Simpson asked unanimous consent to amend on third reading under suspension of the rules. He explained the object of the amendment was to get to work at once on the tunnel. The amendment was defeated when it was pointed out that neither Pennsylvania nor New York had yet acted definitely.

Increased Cost of Highway Work in New York.

Albany, N. Y.—The war has had the effect of nearly doubling the cost of road making in the state of New York, according to a report of the state highway department to the senate finance committee and the assembly ways and means committee bearing on the annual highways appropriation bill. Common labor has jumped from $1.75 a day in 1915 to $3. Crushed stone from commercial plants has risen from 60 cents per ton to $1. Asphalt binder climbed from 4 cents to 10 cents a gallon. Cement increased in price from $1.25 to $2.25 a barrel. The highway appropriation bill as it was originally submitted to the committee carried items for reconstructing approximately thirty miles of old pavement at an average cost of nearly $15,000 a mile and resurfacing 143 of old macadam pavement at an average cost of $9,430 a mile, making a total cost for the 175 miles of $1,787,840. "In 1915," says the department's report, "the average cost of resurfacing 236 miles of old pavement was about $5,200 per mile, while under present prices it is estimated that the work of this nature will cost $9,430 per mile, or an increase of about 81 per cent." The department points out that the proposed mileage to be reconstructed and resurfaced represents only two and one-half per cent. of the entire system of improved state and county roads, which aggregate 6,700 miles. To do the road work would require the services of at least 1,500 men for a period of six months. This would cut in seriously on the farm labor supply in the thirty-seven counties in which the roads are located. "It must be remembered, however," says the report, "that although expediency at this time necessitates the putting off of this needed work there must be a day of reckoning when it will be obligatory for this work to be performed and will necessitate an increased appropriation when the war is over." Carrying an appropriation of $1,500,000 less than was asked for, the bill providing for the maintenance of the state and county highways was introduced in the senate by senator Sage, and in the assembly by assemblyman Machold. The highway department asked for $5,400,000, but the bill carries only $3,787,383. "We need all the money and men we can get on other work at this time," said senator Sage, "and the highway department assures us the reduction will not impair the efficiency of the roads."

Contractor Wins Case on Estimate Errors.

Newburgh, N. Y.—The court of appeals has decided the case of Abner M. Harper, Inc., against the city of Newburgh in favor of the plaintiff. In 1912 Harper, who is a civil engineer and contractor, made a bid for the paving of a street, and deposited a check for $500 as a guaranty. His bid was the lowest, but after sending it in he discovered a mistake in his calculations as submitted, the figures on bluestone curbing and concrete having been transposed in copying. The city refused to surrender the $500 check to Harper, the council having voted him the contract, and the resolution so awarding it awaiting approval by the mayor when Harper gave notice of withdrawal. Harper brought suit for its recovery, claiming the court had power to right a mistake made honestly. On the first trial of the action justice Tompkins decided in favor of the city, but the appellate division reversed the judgment. On the second trial justice Tompkins decided against the city, and the appellate division affirmed the judgment. It was from this decision the city appealed, the decision being now affirmed. Corporation counsel Corwin represented the defendant-appellant. The costs accruing against the city are about $1,000.

Protection of Pennsylvania Highways in Spring.

Harrisburg, Pa.—State highway commissioner J. Denny O'Neil has issued instructions to the fifteen division engineers and to the fifty county superintendents of state highways, requesting that special efforts be made at this time for the protection of state roads. Road conservation, the commissioner stated, is of the utmost importance at all times, but particularly is it necessary at this season of the year, during thaws, and when the frost is leaving the ground in the early spring. State highway employees in all of the engineering districts throughout the state have been instructed to request owners of wagons and motor trucks to take care in driving over the roads while they are soft, and to try to avoid driving continuously in the middle of the road—in ruts. Owners of vehicles of all types are urged to make more frequent hauls rather than to carry excessively heavy loads. Such co-operation, the commissioner states, will mean much in keeping the highways in a travelable condition. The state highway department will take special steps to keep side drains and culverts open so that the water may be kept off the road surface. Vigorous efforts are being made to avoid slides on the mountain roads throughout the state, which, in the past, have been the cause of much expense. Snow removal has caused the extraordinary expense during the winter, costing the state highway department $100,000 to keep the main roads open during the past eight weeks. The snow and the ice, however, have been somewhat of a protection to the road surface. The great damage will be done to the roads when the frost is going out of the ground or during a thaw.

SEWERAGE AND SANITATION

Fight Spinal Meningitis Near Camp.

Charlotte, N. C.—The city and Camp Greene were quarantined for three weeks in order to put down an epidemic of spinal meningitis which seriously threatened them. The quarantine was put on for only two weeks first, but was extended for a third. The camp and all institutions and public places in the city were banned. The situation is in charge of Colonel Eastman, surgeon in charge of medical work at Camp Greene; Major Benjamin W. Brown, United States public health officer in charge of the five-mile zone surrounding Camp Greene; Dr. Joseph K. Bolton, meningitis specialist of the United States public health service, and Dr. C. C. Hudson, city health officer. The physicians pointed out that the real menace is the meningitis carrier. Cultures from hundreds taken recently, it was explained, showed that 3 per cent are "carriers." From this the deduction was made that there are probably between 1,200 and 1,500 "carriers" in Charlotte. Mayor F. R. McNinch and the other city and camp authorities co-operated to make the quarantine very effective.

Court Reverses Commission on Sewerage Rate Increase.

Collingswood, N. J.—Asserting that rates charged by public utility corporations may be unjust and unreasonable if they are too low as well as if they are too high, the supreme court at Trenton has handed down a decision reversing the public utility commission in refusing to permit the Collingswood Sewerage Company to increase its rates, notwithstanding it had been represented that the company was operating at a loss and probably could not continue in business unless permitted to raise rates. The opinion in the Collingswood case, which controls several other decisions, is of far-reaching importance because it indicates that an erroneous construction has been placed upon a previous decision of the court, which was accepted as holding that franchises containing rate provisions constituted irrepealable contracts. It was on this theory that the public utility commission denied the relief sought by the Collingswood Sewerage Company, believing it was bound by the franchise granted by the municipality, fixing a maximum rate to be charged by the sewerage company. In setting aside this view the court said that a municipal franchise granted to a public utility is a conditional grant and not an irrepealable contract. It held that it is within the power of the legislature to delegate to one of its agencies—in the present case the public utility commission—the power to regulate rates, and in such cases this power supersedes the restrictions in the franchise. Two other cases are involved in this important opinion—those of the Northampton, Easton & Washington Traction Company and the Burlington Sewerage Company. In each case the public utility commission refused applications to increase rates because of existing contracts between the corporations and the municipalities in which they operate. In each case it was also proved before the utility commission that at existing rates the companies were unable to secure income sufficient for extensions of service. Justice Swayze, who wrote the controlling opinion, says the utility commission should have ordered a modification of rates and should not have shifted the responsibility to the municipalities by suggesting that the corporations seek municipal action for a modification of franchises. The cases are remitted to the utility commission for new hearings.

WATER SUPPLY

City Raises Water Rates.

Great Falls, Mont.—The city council has decided to raise the water rates instead of levying the two mill tax provided by the state law, of which permissible two mills one mill has already been levied. The water committee of the council had reported that it considered a raise of rates more equitable than a raise of the extra mill by a general levy. The report said in part: "Our present rates as a rule are lower than in any other city in the state, although the cost of delivering is higher. We call attention to the fact that schools and hospitals now have a half rate, churches, the library, fire station and police station, also public markets free, and a flat rate to the Orphans' home, all of which is contrary to a ruling of the public service commission." The recommendations were that a discount of 10 per cent be allowed on all bills paid monthly in advance for flat rates and before the 5th of every month for meter rates. With this concession to those paying in advance or promptly as indicated, the recommendations are that the rate on all residences be raised 20 per cent per month; private baths and toilets, 10 per cent, and 10 per cent discount if paid 30 days or more in advance; irrigation raised from $2.50 to $3 per lot; and a discount of 10 per cent if paid on or before May 31. Hydrant rates were raised to $6. The recommendations were approved and the report was referred to the public service commission at Helena for approval. It is almost a certainty that the committee's report will be approved by the public service commission, whose engineer was present at the council a few weeks ago and heard the discussions. He said the city was entitled to raise its rates on the showing made.

City Pays Half for Water Run to Prevent Freezing.

Elmira, N. Y.—Readjustments of rates are being made by the Elmira water board in the bills of those customers who allowed their water pipes to keep running through the cold periods of January, according to an announcement made by secretary John J. McNevin. The board has devised a sort of "fifty-fifty" plan and takes off about half the difference between the high bill and the average of other months. The water department has had great difficulty with frozen water services.

Newark Gives Water to Jersey City.

Newark, N. J.—Spurred by the seriousness of the water shortage in Jersey City, which threatened to force suspension of trains on the Hudson and Manhattan Railroad line for a few days, Newark went to that city's aid through an exchange agreement with the East Jersey Water Company. The company augmented Jersey City's supply at the rate of 8,000,000 gallons a day, and this city poured 5,000,000 gallons a day into the company's pipes. The situation was called to the attention of director Raymond of streets and public improvements and chief engineer Sherrerd by president Fisk of the Hudson & Manhattan Railroad Company, who said that immediate action was necessary. Newark hesitated about sending water into Jersey City because of the already heavy load on the Cedar Grove reservoir, due to the freezing weather. A scheme to bring an increased amount of water down the pipeline from the Macopin intake reservoir to Cedar Grove reservoir was put into effect by chief engineer Sherrerd. It consisted of raising the intake reservoir dam eighteen inches by the use of flashboards, thus increasing the pressure on the water at the reservoir bottom where it enters the pipeline. By this plan the water carried through the pipeline was increased by about 4,000,000 gallons daily, or to a total of

55,000,000 gallons. With the pipeline from the intake to Cedar Grove capable of carrying only 51,000,000 gallons, as was the case until a few days before, with the pipeline from Cedar Grove to the city capable of carrying 65,000,000 gallons, and with the city using daily, as it has been in these cold days, 56,000,000 or more gallons, the excess of the consumption over that brought from the watershed had to come from Cedar Grove reservoir.

Voters Disapprove Water Conduit Purchase.

Bayonne, N. J.—At the recent special election, the voters disapproved by a very small majority of the purchase by the city of the water-supply conduit property of the New York & New Jersey Water company. The city owns its distribution system, through which it supplies water purchased from the company. The vote stood 2,240 to 2,127. This is the third time this proposition was defeated.

STREET LIGHTING AND POWER

City's Share of Gas Company Receipts.

Philadelphia, Pa.—Upon receipt of the quarterly report of the United Gas Improvement Company for the final quarter of 1917, controller Walton announced that the total revenue received by the city in the year from the sale of gas was $2,223,629.49. Controller Walton said this is the largest annual sum received for any year the gas lease has been in effect. During the quarter ended December 31, 1917, the U. G. I. manufactured and sold 3,138,250,260 cubic feet of gas. In this period the company collected $2,904,993.07, of which the city's share was $588,993.43. The municipal revenue during the three previous quarters was: First quarter, $591,391.08; second quarter, $541,412.88, and third quarter, $501,832.10. The city's total in 1917 was $179,268.72 more than the 1916 figure, which was $2,044,360.77. Last year ended the five-year period during which, according to the terms of the lease, the city's share of the receipts was based on twenty cents of each $1 per 1,000 cubic feet. From now on until the lease expires, ten years hence, the city's share will be twenty-five cents and the company's seventy-five cents.

Gas Rates Increased.

Madison, Wis.—The Wisconsin railroad commission has ordered an increase in the gas rates of the city of Ashland. The new rates become effective February 1 and will continue for six months, when the old rates will be restored. The new rates provide for a minimum monthly bill of fifty cents. For the first five thousand cubic feet of gas per month a gross rate of $1.80 and net rate of $1.65 per thousand, and all over five thousand feet a gross rate of $1.70 and net rate of $1.55. The difference between the gross and net rates will be a discount allowed for payment of bills before the tenth of each month.

Company May Not Raise Rates Arbitrarily.

Red Wing, Minn.—The Wisconsin-Minnesota Light & Power company may not raise its gas rates in the city without first getting the consent of the city council or submitting the matter to a board of arbitration as provided by the city charter. This is finally decided by an order from the supreme court issued upholding the decision of judge Albert Johnson in district court and sustaining the temporary injunction issued by that court. The gas company, which put a raise of 10 cents per 1,000 cubic feet into effect immediately after appealing from the lower court's decision, must make rebate to every consumer who has paid the increase, together with interest. The decision says: "The city has an interest in maintaining the arbitration provisions of the franchise in behalf of its inhabitants for whom it acted when granting the franchise; and since the right of the city and its inhabitants to relief rests upon common ground, this action will lie if there be a threatened breach of contract as to the gas consuming inhabitants, for thereby a multiplicity of suits is avoided." The main contention of the gas company, it appears, was that the arbitration clause of the charter ordinance applied only to rates for gas used by the municipality and not to that supplied private consumers. That is, that prices for street lighting might be arbitrated but not the rates given to individual consumers. The supreme court decided the city, in granting the gas franchise, had in mind securing the same benefits and privileges for individuals as for the municipality. The ordinance, the opinion says, guards against an arbitrary fixing of rates by the gas company. It provides that rates must be fixed by an arbitration board of three when the company and council cannot agree as to rates. This section covers not only gas used for street lighting or municipal purposes, but that used by inhabitants as well, the ruling says. "Where, in a franchise, the interests of the public are involved," says the opinion, "doubts and ambiguities must be resolved in favor of that construction which is most advantageous to the public. The clause providing for a rate not exceeding those of other cities in the state appears, to us, to merely point to the standard which the city council, the arbitrators or the courts, as the case may be, should apply in determining what is a fair rate. In other words, the reasonable or market value of gas is to govern." The company claimed the clause calling for a rate equal to that of other cities in the state to be invalid. The order intimates that comparison of rates with other cities need not enter into the case. The controlling feature is whether the gas company may fix rates for private consumers without the consent of the city council and without arbitration. This the decision rules against.

Provincial Control of Natural Gas in Ontario.

Toronto, Ont.—The Ontario legislature broke all speed records at its first business session when it gave first, second and third readings and unanimously passed the natural gas act, giving the Ontario railway and municipal board wide powers to control and regulate the production and transmission, distribution and sale, disposition and consumption of all the natural gas produced in Ontario. This was an emergency measure, taken to relieve, within the next twenty-four hours, the serious situation which existed in various parts of the province, which depend on natural gas for heating purposes, but especially the city of Windsor and district, where thousands of women and children were reported to be actually freezing owing to the failure of the natural gas supply. The Ontario railway and municipal board is now in complete control of the situation, and has power to control all private corporations. Hon. G. Howard Ferguson stated that the situation in the city of Windsor was so serious that the people in one section of the city had been compelled to leave their homes and go to another part of the city or to Detroit. Heavy penalties were provided for companies or persons failing to carry out the orders of the railway board, the maximum being $1,000, or six months' imprisonment.

FIRE AND POLICE

Fifty Children Die in Fire.

Montreal, Que.—More than fifty children perished in a night fire which partially destroyed a wing of the Grey Nuns' Home here. The home is a great building, occupying a whole block, and part of it is occupied by convalescent soldiers. Although many of them were stretcher cases, all adults were taken out of the building without loss of life. Several of the returned wounded men were seriously injured by falling debris before they could be reached by the large army of rescuers. A dozen or more had to be carried from the second and third stories on beds. There were about one thousand persons in the building—200 returned soldiers, many nursing sisters, nuns, crippled people, aged and children. The fire started on the top floor, near the tower, and immediately caught in the curtains of a nearby window, from which it spread rapidly throughout the wooden interior. All of the top floor was occupied by babes in cots, some of them only a few days old. These were the infants lost, all the older children, who were in another part of the building, being saved. When the firemen had, after valiant work, got the fire under control all the southern part of the top story had been destroyed and a great deal of damage done to the remaining part of the west wing. The returned soldiers who were not confined to their beds lent their efforts to the rescue work. When the first fireman, sub-chief Marin, arrived the soldiers were already at work, at great risk to themselves, in handing children down the fire-escapes. Nearly the whole upper floor was then ablaze. The firemen rushed in and seized children right and left. A sudden gust of flame and smoke which burst from the tower made it impossible to reach children still lying in their cots in that part of the building, but only upon the definite orders of the fire chief were the soldiers debarred from attempting further rescues.

Millionaire Directs New York Traffic Police.

New York, N. Y.—Dr. John A. Harriss has been appointed special deputy police commissioner, without pay, to regulate traffic. Dr. Harriss, who retired from the practice of medicine to manage several business enterprises in which he is interested, took the position because he has for several years been making a study of traffic conditions in New York cities, and has various ideas for their improvement. Dr. Harriss is the president of the International Arms and Fuse Company, president of the International Mail Equipment Company, and president of the Metropolitan Hotels and Amusement Corporation. He belongs to many clubs, including the Automobile Club of America. On accepting the appointment from commissioner Enright Dr. Harriss said: "I am very glad to give my time to the city on this matter because I believe we have no problem which is more acute and pressing than that of traffic congestion on our streets, which causes loss of life, injury and marked inconvenience to our citizens. Unless it can be solved it will seriously hamper proper commercial development. It is my purpose to devote my time and energy to finding a solution of the problem."

Light Plant Destroyed by Fire.

Bowie, Tex.—The local power plant of the Texas Light and Power Company, which furnishes power and light for this city, was recently destroyed by fire. The firm had been constructing a new power house on the opposite side of the city from the old plant and had already received several pieces of machinery. The company installed a dynamo in the gin plant just across from the site of the fire, and is furnishing the city with light from this plant. The pumping station of the city waterworks, which is located adjoining the power plant, being housed in a brick building, was not damaged.

Port Newark Fire Due to Contractors' Negligence.

Newark, N. J.—Announcement has been made by the attorney general at Washington that the fire which recently caused at least $400,000 damage at the wharf of the newly established army quartermaster's depot at the Port Newark Terminal was not due to incendiarism, but was caused by "gross carelessness" on the part of contractors engaged in the construction of the wharf. The alleged negligence is declared to have been so flagrant that the agents who made the investigation of the origin of the fire for the Department of Justice have recommended that the government institute civil proceedings to recover the cost of the damage. The investigation showed that the contractors had permitted a foreman, on the day before the fire, to build a dryer apparatus on the wharf near a fifty-gallon tank of gasoline. Not far away were several barrels of oil, and moored to the dock was a barge containing 600 barrels of crude oil. Two investigations were made, one by agents of the Department of Justice and the other by a military commission. The report of the latter commission, similar to that made by the Department of Justice agents, has been approved by the commanding general. The statement by the Department of Justice says in part:

"The result of this investigation calls attention again to the impossibility of safeguarding waterfront facilities by means of military guards, unless the owners co-operate by taking all proper precautions. Here, as in most other cases, damage came from internal causes. In this particular case the contractors, simply because a military guard was furnished for the outside of the premises, appear to have cast aside all sense of responsibility for the internal supervision of the premises.

"The disaster emphasizes the duty of private owners to provide proper protection in the way of expert watchmen, proper lighting facilities, etc., on the premises themselves. It demonstrates anew the folly of manufacturers demanding mill guards and at the same time failing to meet the duty laid on them of taking extraordinary precautions within the plants to protect against damage. The investigation shows a gross neglect of even the most ordinary precaution and watchfulness.

"The report discloses that the contractors had permitted a foreman on Jan. 25, the day preceding the fire, to lay on this wharf, constructed of creosoted wood, a sand and cinder drying apparatus consisting of two twenty-foot sections of pipe two and a half feet in diameter, and to build in this dryer a fire to which were fed the tops of oak piling and heavy yellow pine timber. The Superintendent admitted that he had permitted the installation of this apparatus on the dock.

"Near the dryer was placed a fifty-gallon tank of gasoline, fuel for a concrete mixer. More distant, but not remote, were several barrels of oil that had been left on the dock by an oil company, owners of the property purchased by the Government for the depot, and moored to the dock was a barge containing 600 barrels of crude oil. The fire was drawn from the dryer at 5 o'clock on the afternoon of Jan. 25; the burning of the dock was discovered shortly after midnight of that day."

Two witnesses called, employed by sub-contractors engaged on the work, testified that the fire in the pipes was burning at 10.30 o'clock that night. The direction of the wind on the evening of the fire is set forth in the report to show that it blew from a quarter that would cause the coals to be enlivened.

Arson experts of the National Board of Fire Underwriters, supported by the fire prevention expert of Newark who visited the scene of fire while it was in progress, according to the report, expressed the opinion that the fire was caused by the intense heat of the pipes, having been conveyed to the cinders and coal that constituted the bed upon which the pipes lay. Testimony obtained by the department's agent showed that a hole two and one-half feet in diameter had been burned through the planking under the pipes.

$300,000 Fire Destroys College Building.

Poughkeepsie, N. Y.—Fire starting in the servants' quarters on the fourth floor of the main building at Vassar College destroyed the floor and roof of the south wing, with a loss of $300,000. Many valuable relics, bequeathed to the college by its founder, are included in the loss. No lives were lost and no injuries were reported. A call for troops was telephoned to the state armory in Poughkeepsie in the early stage of the fire, and about fifty men were sent to help the students. Most of the students returned to their rooms before midnight. The students' rooms were not damaged seriously. The building, which was built in 1861-1865, was the first building erected at Vassar. The main building is situated apart from the other college buildings. All possible safeguards against fire had been provided in the construction and equipment of the building. Special fire walls were so installed that the different wings, as well as the central hall, could each be separated from the others in case of necessity.

MOTOR VEHICLES

New Truck Does Well in Test.

Gloversville, N. Y.—The city's new $7,200 fire truck performed very satisfactorily in the recent tests given in the presence of mayor Abram Baird, the council fire chief R. A. Maxon, fireman, and a large number of citizens. Carrying nine city officials it plowed its way up the steepest grades in the city through deep snow. It was taken to the Cayudetta Creek for the pumping tests. Here it threw 303 gallons per minute with a pressure of 105 pounds through 100 feet of hose. Ordinary hydrant pressure in the city is only between 50 and 70 pounds, 75 with high pressure. The new machine can throw a stream to the top of the highest building in the city, it is said.

New Triple Combination in Service.

Superior, Wis.—The triple combination chemical pumper and hose wagon recently bought by the city department brings the department up to the very latest in modern equipment. Fire chief Johnson is very much pleased. The contract price is $10,250. Three manufacturers of fire-fighting equipment submitted tenders, all of which were about the same. The decision to purchase the American-La France engine came as a result of the satisfactory showing the other combination has given the city during the three years it has been in service. In a recent test, according to the chief, "the old engine performed as well as at the acceptance test, developing over 100 horsepower and registering 800 gallons of water a minute." The new engine is rated at 105 h. p. and guaranteed to possess a capacity of

750 gallons a minute. It will eliminate the work of five horses and two men. According to chief Johnson the new equipment will pay for itself in three years in the saving of departmental expenditures. The apparatus has a six-cylinder engine. It carries 1,200 feet of 2½-inch hose and a chemical tank.

GOVERNMENT AND FINANCE

New City Manager Appointed.

Gallipolis, O.—The city commission has appointed Edward E. Myers city manager at a salary of $1,500 a year. According to local reports, manager Myers "was raised on a farm, came to Gallipolis as a mechanic at the hospital, was elected sheriff and served two terms, and later ran an automobile garage. He has been an active political worker."

Cost of Appealing Case from Commission.

Springfield, Ill.—The members of state public utility commission have been placed in contempt of court in a friendly suit before the circuit court of Sangamon County. This will be in force until the Illinois supreme court decides whether a litigant taking an appeal from the commission to the circuit court shall pay the state for the cost of preparing the record. The question has been before the courts for two years. The commissions were before judge E. S. Smith in response to a citation for contempt following their refusal to file the record in a case. The cost of preparing the record had not been paid. The commissioners were fined $25 and costs, payment being suspended during the appeal to the supreme court. The commission bases its demand for payment on the Illinois Public Utility Law. In the appeal of the Springfield Gas & Electric Company from a commission order the company contested payment of the fee for preparing a record, amounting to several hundred dollars. The court required the company to deposit the amount of the fee in a bank, designated by the court, pending a decision upon the point. Since then contingent payment has been guaranteed in some cases.

New York City's Debt Limit.

New York, N. Y.—Controller Charles L. Craig has sent to Mayor Hylan a letter setting forth the city's debt limit at the time he took office and the estimated amount the city will have to spend during 1918 after the necessary requirements are taken care of. The estimate places the debt-incurring power which may be available for authorization for any municipal purpose which the board of estimate may determine at $10,861,338.59. This amount may be increased $9,849,271.56 more, the controller stated, by using for other purposes the amount set aside for the South Brooklyn marginal railroad and the balance of the reserve for dock, port, and terminal improvements. The debt-incurring power of the city, or its debt limit, on January 1, 1918, the controller stated, was $50,270,155.96. Against this there are commitments, unincumbered balances of authorizations of corporate stock for public improvements, etc., amounting to $31,851,077.05. According to the controller, these amounts "reflect the authorizations and reserves which have heretofore been made and are in the nature of contingent incumbrances on the city's debt-incurring power."

"It may be noted from the debt limit statement that the $50,270,155.96 of debt-incurring power possessed by the city is reached after charging, in addition to the constitutional funded debt, a further net debt of $61,514,872.06, consisting of liability for lands acquired by the city for various purposes; of contract liability for rapid transit and other purposes still to be earned, and the amount of open market orders on the books of the Department of Finance. From the viewpoint of financing, therefore, the city could borrow upward of $61,000,000 by means of corporate stock or corporate stock notes to provide funds to pay these land liabilities and to meet these particular contract liabilities as they crystallize into amounts actually earned, without decreasing the $50,270,155.96 debt limit or debt-incurring power of the city."

The estimated additional requirements for improvements, etc., which will require to be provided during the year, Controller Craig says, will increase the available debt limit to $63,212,415.64. Commitments for rapid transit purposes, schoolhouse sites, street and park openings, and the South Brooklyn Marginal Reserve will amount to $52,351,077.05, leaving as remainder $10,861,338.59.

The total funded debt of the city, made up of long-term corporate stock, corporate stock notes, serial bonds, assessment bonds, and general fund bonds, the Controller puts at $1,214,948,477.26. Of this total, the sinking funds hold plus cash available for redemption, $194,277,375.01, leaving the net amount of funded debt $1,020,671,102.25.

Tax Assessment on Intangible Values of Utility.

Beverly, N. J.—Mayor Thomas E. Lee has won his fight to compel the Delaware River Water Company to pay taxes on increased assessments of its properties here. The case, which has been fought out on the appeal of the company before the Burlington county tax board, has aroused state-wide interest, as it establishes an important precedent that permits cities to assess utility companies nearer to their stock valuations. This is said to be the first time a New Jersey municipality has gone after the taxes from just this angle. In asking utility commission to permit an increase in its capitalization the company said recently that it had assets of $432,000 on which it should be permitted to earn a dividend. During the tax board hearing city attorney Francis Smith subpoenaed a banker to further show that the company in 1910, to procure a $150,000 mortgage loan, had filed an affidavit to the effect that its properties were worth $358,000, with an undivided surplus of $58,000. But the company paid taxes up to three years ago on an assessment of only $25,000 in Beverly City, where its main plant is located, and on an additional assessment of $25,000 in Beverly township and $23,000 in Riverside township, which it also supplies with water. A score of municipalities, including Collingswood, where the same interests controlling the Delaware River Water Company here own a water plant, have been waiting a conclusion of the case here before commencing similar action. "The decision means that if a utility corporation asks the right to earn a dividend on its watered stocks it must pay taxes on the intangible values represented by those stocks," says mayor Lee. "The companies can't pay taxes on their inflated values and exist. It means a rapid squeezing out of the water or the forcing of the companies into public ownership."

STREET CLEANING AND REFUSE DISPOSAL

City Garbage Profits Cut by Conservation.

Columbus, O.—Wartime conservation and economy in Columbus has cut the profits of the municipal garbage reduction plant over $30,000 during the last year, according to a statement made by Thomas D. Banks, superintendent of the plant. The profits for 1916 were approximately $40,000, and for 1917 they were about $8,000. In 1916 the city collected and turned over to the plant 1,344,789 pounds of garbage, and in 1917 there was collected 676,759 pounds. In addition to the decrease in garbage collected, superintendent Banks says there was a considerable decrease in fats in the garbage. Because of the increase in the price of grease, Banks expects the receipts of the plant to be increased in 1918. The contract for the tankage from the plant was awarded some time ago to the Farmers' Fertilizer company, of Columbus, at a price approximately double the price received for this product in 1917.

Merchants Aid Snow Removal.

New York, N. Y.—The Merchants' Association recently called on New York merchants to render aid to the street cleaning department in removing snow this winter by lending trucks to the city during snowfalls. The committee on City Conditions, of which John C. Eames is the chairman, after outlining the plan in a general way, said: "Under this plan, several hundred trucks or more, together with the necessary help for loading, can be at once employed in snow removal from business streets designated by the commissioner, whereas several days would necessarily elapse before all of the streets could be freed from snow if only the force of the department were employed." The committee urged that a personal canvass of merchants using trucks be made, to the purpose of organizing this auxiliary snow-fighting force early in the winter.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Private Road—Permissive Use.

(Mich.) Mere permissive use of a private road, however long continued, will not make it a public highway.—Weihe v. Macatawa Resort Co., 164 N. W. 510.

Road Routes—Selections.

(Ky.) Under Ky. St. §§ 4356w, 4356x, subd. 3 et seq., fiscal court may establish new routes, and is not restricted to roads theretofore laid out by order of county court.—Campbell v. Hammons, 197 S. W. 646.

Assessments—Paving Intersections.

(Or.) Where it is discretionary with a city council to include or exclude the cost of intersections when making paving assessments, it cannot be prevented from levying special assessments for an improvement, even though it has in the past paid for the same kind of improvement by general taxation.—Colby v. City of Medford, 167 P. 487.

Non-Property Owners—Damages for Street Closing.

(Ky.) Persons not owning property abutting or adjoining public street in city of fifth class cannot recover damages for closing street.—Jameson v. Louisville & N. R. Co., 197 S. W. 386.

Damages for Street Vacation—Recovering.

(Ill.) If damages for vacation of a street for which municipality is liable under Hurd's Rev. St. 1915-16, c. 145, § 1, are not determined before vacation, property owner may recover them at any time within statute of limitations.—Lockwood & Strickland Co. v. City of Chicago, 117 N. E. 81.

Contractor's Bond—Council Decision.

(Va.) Whether bond should be required of municipal contractors rests in discretion of council, with which courts will not interfere, even on complaint of citizen.—Town of Appalachia v. Mainous, 93 S. E. 566.

Decision of Council—Completion of Pavement.

(Or.) The determination made by the council that the specifications and the contract of a paving contractor have been fulfilled and completed is conclusive.—Lawrence v. City of Portland, 167 P. 587.

Laying Out Addition—Starting Point of Survey.

(Ill.) Though particular stone should have been used as starting point by surveyors in making subdivisions, in view of fact that owners and surveyors, in laying out addition and subdivision, staked street on ground itself at particular point in accordance with another stone, the proper line of the street was as laid out.—Wolpert v. City of Chicago, 117 N. E. 447.

Obstruction of Stream—Liability of Municipality.

(Idaho) A municipality, as a riparian owner, may construct a breakwater to protect its property; but if it so obstructs a stream as to divert it and damage property of another riparian owner it is liable.—Boise Development Co. v. Boise City, 167 P. 1032.

Obstruction in Streets—Nature—Liability.

(Mass.) The right to put obstructions in street must be exercised with due regard to safety and convenience, and should not be of such a nature as would be likely to frighten horses.—Hurley v. Boston & M. R. R., 117 N. E. 591.

Injury to Pedestrian—Liability of City.

(Iowa) City was liable for injuries to pedestrian at an alley crossing through accumulation of snow and ice, though recent rains had caused rough places on crossing to become more slippery and dangerous than before.—Dewall v. City of Sioux City, 164 N. W. 640.

Right to City to Vacate Street or Alley.

(Ill.) A city in the lawful exercise of its discretion may vacate a street or alley.—Lockwood & Strickland Co. v. City of Chicago, 117 N. E. 81.

Flooding Land—Damages.

(Ky.) Where a city drained its reservoirs annually into a creek running across plaintiff's land, and recovery was had therefor, that the city flooded the land the following year did not entitle plaintiffs to punitive damages in the absence of evidence of malice or oppression.—City of Covington v. Faulhaber, 197 S. W. 1065.

Paying Assessments in Installments.

(Or.) L. O. L. §§ 3245-3253, providing that owners of property may postpone payment of assessments by dividing them into installments, applies to every incorporated town and city; and although a city can legislate concurrently on the same subject it cannot compel an owner to accept its plan.—Colby v. City of Medford, 167 P. 487.

Liability of Town—Private Construction of Grand Stand.

(N. C.) If defendant town authorized construction of grand stand on its common by private party it would not be liable for injuries suffered by plaintiff due to its negligent construction.—Morgan v. Town of Tarboro, 93 S. E. 470.

Use of Roadway for Fifty Years—Prescription.

(Ill.) The use and enjoyment of a roadway by the public for more than fifty years create a presumption of a grant or a way by prescription.—Law v. Neola Elevator Co., 117 N. E. 435.

Compensation of Firemen—Power of Local Authorities.

(Neb.) Rev. St. 1913, §4210, as amended by Laws 1915, c. 77, fixes the compensation of firemen in metropolitan cities, and the city authorities have no power to provide different compensation.—Adams v. City of Omaha, 164 N. W. 714.

Traffic Rules—Rights of Way.

(Minn.) Provision of Minneapolis traffic ordinance that vehicles on certain streets shall have right of way at street intersections over vehicles upon the intersecting streets is not abrogated by Motor Vehicle Law (Gen. St. 1913, §2637).—Bruce v. Ryan, 164 N. W. 982.

Local Assessments—Exemption—Damages.

(Wash.) A stipulation in a petition for a local improvement, waiving exemption from assessment by reason of damages, may be abrogated by the parties thereto by a subsequent agreement.—In re Patterson, 167 P. 924.

Power of Municipalities to Carry Out Orders.

(Idaho) Municipalities have implied authority to take whatever lawful means are necessary to carry out their express powers, and to protect their property.—Boise Development Co. v. Boise City, 167 P. 1032.

Election Notices—Requirements.

(Ky.) Under Ky. St. §3069, as to bond issues by municipalities requiring ordinance to be published for at least two weeks just preceding election in official paper, notice must be printed continuously in every issue of official paper during the period of two weeks prior to election.—Hatfield v. City of Covington, 197 S. W. 535.

Negligence of City—Liability.

(Wash.) It is negligence for city to place across sidewalk a one-inch water pipe one inch or more above surface of walk without protecting pipe at night by light or otherwise.—Blackwell v. City of Seattle, 167 P. 53.

Services to City by Mayor—Right to Compensation.

(Iowa) Where mayor of city performed services as laborer in violation of Code Supp. 1913, §879q, city council cannot, where he defended action to recover amount paid him, appropriate public moneys to reimburse him for his counsel fees and costs.—Peet v. Leinbaugh, 164 N. W. 127.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

March 13.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington. Secretary-treasurer, Geo. A. Reed, Montpelier, Vt.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

Southwestern Water Works Association.

The Southwestern Water Works Association, comprising membership in the states of Texas, Louisiana, Arkansas, New Mexico, Kansas, Missouri, and Oklahoma, will hold its seventh annual convention in Tulsa, Okla., April 23 to 26, inclusive. This association includes in its membership water works officials in all the states named.

The officers have made arrangements to have presented some of the best papers by experienced engineers and superintendents the association has ever had. Tulsa will extend a most cordial welcome, and has arranged a splendid program.

The president of the association is J. W. Bennett, Oklahoma City, Okla., and the secretary-treasurer is E. L. Fulkerson, Waco, Tex.

Illinois Society of Engineers.

The thirty-third annual meeting of the Illinois Society of Engineers held at Quincy, Jan. 24 and 25, brought out interesting discussion, particularly on the subjects of road and street improvement and drainage. Part of the time usually devoted to general meetings was assigned to the various sections. S. A. Greeley, of Chicago, gave an illustrated talk on sewerage at Camp Custer. The consideration of drainage problems included papers by A. L. Webster, of Wheaton, chairman of the drainage section of the society; new laws and decisions on drainage by E. J. Chamberlain, of Cairo; merits and defects of the levee act by attorney Miles S. Gilbert, of Pittsfield; the bridge question in drainage districts by G. F. Burch, of Cairo; drainage works near Quincy by A. H. Beitman, of Quincy, manager of the E. T. Perkins Construction Company, one on "Tile—More Tile," by J. A. Reeves, of Oak Park; and "Topographic Surveys for Drainage Districts" by L. H. Williams, Quincy.

The second day's sessions were devoted to roads and pavements, and four papers were presented on these subjects in the morning. These were: "Features in Brick Pavement Construction," by G. N. Reiter of Chicago; "Bituminous Foundation of Pavements," by Lester Kirschbraun of Chicago; "Illinois Highways," by Clifford Older, state highway engineer, and "Handling Materials on Road Work," by William Ord of Cleveland.

In the afternoon there were addresses on wearing resistance of concrete with reference to consistency and curing conditions, by D. A. Abrams of the Lewis institute, Chicago; "Paving in Chicago," by H. J. Fixmer of the Chicago board of local improvements. Concrete curbing and finishing of concrete pavements were discussed by C. M. Powell.

A joint meeting at dinner was held with the Illinois Highway Improvement Association, at which the $60,000,000 road bond issue for the state was discussed, among the speakers being W. G. Edens of the association and S. E. Bradt, superintendent of highways.

W. T. Barnes read a paper on inspection of sewerage systems and disposal plants. G. C. Habermeyer, acting director of the water survey division of the new state Department of Public Works and Buildings, described the work of the division.

Bloomington was chosen for the next meetings. T. C. Melluish, Bloomington, was elected president and T. W. Dappert, vice-president. W. P. Bushnell, Quincy, and S. A. Greeley, Chicago, were elected trustees. E. E. R. Tratman, Wheaton, is to continue as secretary.

Montana County Commissioners.

Commission government for counties was urged by former senator Joseph M. Dixon in the principal address of the first day before the state convention of Montana county commissioners, held recently in Missoula.

The commissioners devoted the second day of their meeting to discusion of road building, while auditors, assessors, treasurers, clerks, attorneys, surveyors and sheriffs were holding separate sessions.

Governor Stewart was the chief speaker at the second day of convention. Attorney general Ford and H. L. Hart, state treasurer, also spoke. The general sessions were devoted to the subject of taxation. The assessors reported a standard schedule of property valuation.

Several of the official groups elected officers. The results of these elections follow: Auditors—Mrs. Ethel Evenson, Missoula county, president; R. H. Michaels, Custer county, vice-president; G. J. Bonnie, Hill county, secretary-treasurer. Attorneys—Fred R. Angevine, Missoula county, president; L. J. Onsted, Sheridan county, secretary-treasurer. County clerks—W. J. Babbington, Missoula county, president; B. P. Ross, Big Horn county, vice-president; F. E. Williams, Yellowstone county, secretary-treasurer.

The commissioners also heard addresses by mayor H. T. Wilkinson of Missoula, W. H. Bowman of Hardin, state bank examiner H. S. McGraw and president E. O. Sisson and dean A. L. Stone of the state university, Oscar Rohn, president of the state highway commission, assessor Martien of Lewis and Clark, Paul D. Pratt, the highway commission's engineer, and surveyors Ruffner of Dillon and Manwaring of Silver Bow. Herbert Nunn, state highway engineer of Oregon, gave an illustrated lecture.

Engineers' Club of Philadelphia.

On Feb. 29, the Engineers' Club of Philadelphia will be addressed by Prof. C. E. Lucke, civilian director, U. S. N. Gas Engine School, Columbia University, on "The Heavy Oil Engine."

On Feb. 6, Dr. R. S. MacElwee, Columbia University, read a paper on "Ports and Terminal Facilities."

Providence Engineering Society.

On Jan. 9 the power section of the Providence Engineering Society was addressed by Frederick B. Kenney, of the Blackstone Valley Gas and Electric Company on the subject "Central Station vs. Isolated Plant."

On Jan. 23 H. Anthony Dyer read a paper on the "Development of the Metropolitan Park System" before the municipal engineering section.

As a result of the canvass of the society made last month to determine whether to hold the annual banquet this year, the council has decided to omit this feature on the grounds of patriotism, food conservation and economy. This is in accordance with the sentiments expressed by the majority of the members replying.

Municipal Engineers of New York.

The next regular meeting of the Municipal Engineers of New York will be held at 8:15 p. m. in the Engineering Societies Building, 20 West 39th street, Manhattan, on Wednesday, February 27, 1918. A paper, entitled "Influence of City Zoning on Sewage Flow Assumptions Using Floor Area Basis," will be presented by Mr. Walter S. McGrane, assistant engineer, bureau of sewers, borough president's office, Manhattan.

This paper is to be presented in two parts, the first part being entitled "Fundamental Sewage Flow Assumptions in the Borough of Manhattan." Under this heading will be set forth the reasons why the old methods of estimating dry weather flow factors are not adaptable to the special conditions existing in Manhattan; the presentation of a new method, based

(*Continued on page 178*)

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is a tendency to cut about $2 a ton on 6-inch and $1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has a number of type "S" centrifugal pumping units available for shipment within fifteen to thirty days from the West Allis works. These are double suction, bronze fitted, split casing centrifugal pumps direct connected to Allis-Chalmers squirrel cage motors with potential starters. The three-phase 60-cycle units range from 2 to 125 h. p., and from 2-inch to 12-inch, voltages are 220 and 440—three of the units are 2,200 volts. There are twenty three-phase 25-cycle units, one each in sizes ranging from 2-inch to 6-inch and 2 to 40 h. p., all 440 volts. These units should prove attractive to engineers and municipalities desiring standard pumping equipment under rush conditions not easy to meet in these days.

Motor Truck's Record Trip of 391 Miles.—A four-wheel drive Duplex truck, made by the **Duplex Truck Co.**, Lansing, Mich., made a trip from the company's factory in Lansing to Pittsburgh in 60 hours actual running time. So successful was the trip from every standpoint that regular trips are to be made from the Michigan capital to the eastern city.

In order that accurate information might be obtained and the practicability of the Duplex for overland haulage work determined, the driver of the truck made a careful record of the trip. The total mileage was 391 and the total number of gallons of gasoline used was 59, or six and three-fifths miles per gallon. Five quarts of oil and one pint of water were required for the trip. The truck left Lansing at 3 o'clock on a Monday afternoon and arrived in Pittsburgh the following Friday morning at 2 o'clock. The total cost of operation, including driver's wages and expenses, cost of gasoline and oil, and including depreciation, tires, insurance and maintenance, was $56.11. The railroad freight rate between Lansing and Pittsburgh on 7,000 pounds, the truck's capacity, is $41.30, or $14.81 less than the cost of transporting three and one-half tons of merchandise by Duplex truck. However, the Duplex hauled its load of merchandise direct from the manufacturer's factory in Lansing to the business house of the purchaser in Pittsburgh, thus saving a cartage charge at both ends that would total several dollars.

"The 391-mile trip was made without accidents or mechanical trouble of any kind," said President H. M. Lee of the Duplex Truck Company. "The only delay occurred when the Duplex was held up four and one-half hours by other trucks that were stuck in the mud between Cleveland and Pittsburgh. The trip was truly a remarkable performance when it is considered that the truck left Lansing in a regular Michigan blizzard and hauled its load through eastern Ohio roads hub deep in mud. The freight was delivered in Pittsburgh three and one-half days after it left Lansing—several days in advance of the freight traffic schedule of railroads."

The American-La France Fire Engine Co., Inc., Elmira, N. Y., has received the following orders:

Charleston, W. Va.—1 type 75 pumping engine, 1 type 12 pumping engine, 2 type 10 combination, 1 type 40 combination with Junior pump, 1 type 31 75 ft. aerial truck; Deming, New Mexico—1 type 40 combination with Junior pump; Hannibal, Mo.—1 type 75 combination with Junior pump; Jamestown, N. Y.—1 type 14 service truck; Los Angeles, Cal.—1 type 75 pumping engine, 1 type 31 tractor, 1 type 17 tractor, 1 type 75 combination; Nanticoke, Pa.—1 type 12 pumping engine; Newark, N. J.—2 type 40 combination chemical engine and hose car; Osceola Mills, Pa.—1 type 40 pumping engine; Red Bank, N. J.—1 type 75 pumping engine; Superior, Wis. —1 type 75 pumping engine; Swarthmore, Pa.—1 type 14 service truck; Washington, D. C.—1 type 75 pumping engine, 4 type 20 combination with booster pump, 1 type 31 85 ft. aerial truck; New Brighton, Pa.—1 Brockway type B combination; Red Bank, N. J.—1 type A Brockway combination; Ticonderoga, N. Y.—1 type B Brockway combination; American International Shipbuilding Corp.—2 type Brockway service truck; American International Shipbuilding Corp. —2 type 12 combination; Piscatinney Arsenal, Dover, N. J.—1 type 75 pumping engine; Submarine Boat Corp., Newark, N. J.—1 type 20 combination.

Laboratory Work of Portland Cement Association.

On February 8 state highway engineers and testing engineers from various states accepted an invitation of the Portland Cement Association to visit the Structural Materials Research Laboratory, Lewis Institute, Chicago. This laboratory, which is operated jointly by the Portland Cement Association and Lewis Institute, has become well known for the research work that is being carried on there under the direction of Professor D. A. Abrams in various lines associated with cement and concrete.

Visiting engineers listened to a lecture by Professor Abrams, outlining laboratory work, and also to a talk by Dr. O. E. Harder, laboratory chemist, who related the experiments that have been made and the results obtained with the colorimetric test for organic impurities in sand, which was developed by Professor Harder in the institute laboratory.

In the evening the guests were entertained at dinner, following which there were round-table discussions, which brought out many impressions received during the day.

Among the states represented by highway officials and others were Arkansas, Connecticut, Illinois, Iowa, Indiana, Maine, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, North Dakota, West Virginia and Wisconsin. Canada was represented by W. A. McLean, deputy minister of highways; C. R. Wheelock, president of the Ontario Good Roads Association, and H. A. Brazier, civil engineer. The state highway engineers of Illinois, Missouri, Ohio and South Dakota were present in person.

PERSONALS

E. J. Fort, chief engineer, bureau of sewers; H. H. Schmidt, chief engineer, bureau of highways, and George W. Tillson, consulting engineer to the borough president of Brooklyn, New York City, have been retained in the city's service, the order abolishing their positions, mentioned in this column last week, having been rescinded.

Hardenbergh, W. A., assistant editor of Municipal Journal, has been appointed assistant sanitary engineer in the United States Public Health Service. He is reporting at Macon, Ga., to assume his duties in connection with the malaria control work of the service.

Luther James N., formerly county commissioner, has been appointed superintendent of waterworks, South Bend, Ind.

Ruger, Charles E., city manager of Manistee, Mich., has resigned.

Whitten, Robert H., has opened an office for consulting work on city planning at 277 Broadway, New York. Mr. Whitten has had some five years' experience in city planning and zoning work in New York City. He served as expert for the Heights of Buildings Commission which made its report in December, 1913. As secretary of the Commission on Building Districts and Restrictions he had a very important part in the development of the New York building zone plan. As secretary of the Committee on the City Plan of the Board of Estimate and Apportionment from its establishment in 1914 until its recent abolition by the Hylan administration he has had supervision of petitions for changes in the building zone plan; has initiated a number of improvements in city planning legislation and had started work on a comprehensive study of street congestion and main traffic routes. He has recently made a report for the United States Shipping Board on the housing and transportation conditions for shipyard workers in the yards adjacent to Newark Bay. Previous to his employment in zoning and city planning work Mr. Whitten was with the New York Public Service Commission, First District. He is the author of an authoritative treatise on the valuation of public service corporations and also a monograph on the regulation of public utilities in Great Britain. Mr. Whitten is a member of the American City Planning Institute.

The following officials have been elected in Norristown, Pa.: President, town council, Norwood D. Matthias; clerk, Harry Maxwell, jr.; engineer, S. Cameron Corson; solicitor, Henry M. Brownback; committee chairmen—highways, Daniel Sinclair, jr.; water and lamp, Elmer E. Beidemen; sewer, S. Milton Rambo; fire and water and finance, George W. Pifer; park, H. Severn Regar; sanitary, Dr. Wm. G. Miller.

The following are new mayors:

Pittsfield, Mass.—W. C. Moulton.
Gloucester, Mass—John A. Stoddard.
Taunton, Mass.—William Flood.
Holyoke, Mass.—John D. Ryan.
Northampton, Mass. — Alvertus J. Morse.
Portland, Me.—Charles B. Clarke.
Cheyenne, Wyo.—Edward W. Stone.
Ocala, Fla.—J. E. Chace.
Sarasota, Fla.—G. W. Franklin.

Scranton, Pa.—City engineer, William Schunk; dept. of police, Lona B. Day; supt., bureau of fire, Peter J. Rosar; supt., police and fire alarm, William J. Neave; chief engineer, mine cave commission, Arthur W. Long; bureau of ashes and garbage collection, Jacob Mantz; supt. of parks, Thomas Phillips; city bacteriologist, Dr. Irwin W. Severson; supt., highways and sewers, Richard V. James.

Indianapolis, Ind.—Mayor, Charles W. Jewett; board of public works, Schuyler A. Haas, president, George Lemaux and Thomas H. Riley; board of public safety, Alexander L. Taggart, chairman, Felix M. McWhirter and Jacob H. Hilkene; city purchasing agent, Dwight S. Ritter; chief of police, George V. Coffin; fire chief, John C. Loucks; city engineer, Henry W. Klausmann; supt. street cleaning, Charles R. Gift; street commissioner, A. O. Maloy.

Olean, N. Y.—Mayor, Foster Studholme; city clerk, Raymond G. Porsch; supt. streets, E. E. Allen; fire chief, L. G. Rodgers; water commissioner, James M. Homer; commissioner of public works, George H. Luther.

Yonkers, N. Y.—Mayor, William J. Wallin; city engineer, Lawrence Griffith; commissioner of public works, Thos. See; commissioner of public safety, Walter B. J. Mitchell; health officer, Dr. C. W. Buckmaster; water bureau supt., William Colquhoun.

Bethlehem, Pa.—Mayor and supt. public affairs, Archibald Johnston; supt. accounts and license, Alexander C. Graham; supt., public safety, Thomas F. Rowan; supt., streets and public improvements, A. W. Schlich; supt., parks and public property, James E. Mathews; city engineer, Robert L. Fox; city clerk, Stephen H. Hughes; supt. of police, Curtis A. Davies; fire chief, A. E. Anderson; health officers, E. E. Houser and T. P. Nicholson; water supt., Chas. E. Bender; city planning commission, C. M. Schwab, W. A. Wilbur, E. G. Grace, H. J. Meyers and Charles Kurtz.

NEWS OF THE SOCIETIES

(Continued from page 176)

on a unit floor area system in predicting the future sewage flow for this borough, its relation to different types of districts and the verification of the accuracy of this method through actual sewage gaugings.

The supplemental paper, entitled "Method of Gauging Sewage Flow in the Borough of Manhattan," comprises a description of the development of the methods of gauging employed, the special difficulties encountered and the attempts to obtain automatic gauge records of the sewage flow. The paper will be illustrated by lantern slides.

Montana Institute of Municipal Engineers.

The three-day annual meeting of the Montana Institute of Municipal Engineers, held recently at Bozeman, was in the form of reports of committees. The subjects considered were: Street cleaning and garbage disposal; sewers and sewage disposal; standardized specifications; highways and pavements; and water systems and purification plants. Captain Gerharze spoke on the part of the engineer in war. The following officers were elected: J. D. McLeod, Helena, president; A. B. Birkland, Lewistown, vice-president; R. E. Malsor, Bozeman, secretary-treasurer; F. O. Snow, Bozeman, and M. L. Morris, Great Falls, directors.

Civil Engineers' Society of St. Paul.

At the recent annual meeting members of the Civil Engineers' Society of St. Paul declared themselves in favor of a state law licensing civil engineers to practice their profession in the state. Reports of the several committees showed that the society had taken an active part in civic affairs, especially in the revision of the St. Paul building code. The following officers were elected: Prof. A. F. Meyer of the University of Minnesota, president; E. S. Spencer, vice-president; Paul C. Gauger, secretary; E. O. Korsmo, treasurer; C. H. Stewart; George H. Herrold, representative to the Minnesota Joint Engineering Board.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Kingfisher, Okla., is to build WATERWORKS. Preliminary plans for the plant are in course of preparation by the engineering firm of Black & Veatch.

Topeka, Kan., is to improve its WATER SYSTEM by drilling wells and constructing a tunnel. Plans are in course of preparation by W. Kiersted.

Shelby county, Harlem, Ia., is to carry out a RIVER STRAIGHTENING PROJECT. The consulting engineer for the work is J. Harley Mayne.

A STREET LIGHTING SYSTEM is being built by Conrad, Mont. C. P. Wells, consulting engineer, is in charge of the work for the city.

Kandiyohi county, Willmar, Minn., is constructing a DRAINAGE SYSTEM. Plans and specifications for the improvement were prepared by the Kibbey Engineering Service Co.

Oxnard, Cal., is building a WATER SUPPLY SYSTEM, including pumping and distribution. Plans and specifications for the work were prepared by Olmsted & Gillelen.

Alameda county, Oakland, Cal., is to build, jointly with the Southern Pacific R. R., a double bascule BRIDGE over inner Oakland Harbor at a cost of $1,750,000. The consulting engineers for the structure are Harrington, Howard & Ash.

BRIDGE repairs are to be made by Jackson, Minn., according to plans being prepared by J. H. A. Brahtz.

Improvements to its WATER WORKS are to be made by Norwich, Ont. Plans and specifications for this work were prepared by F. J. Ure.

A WATER SYSTEM is to be built by Wewoka, Okla. Plans for the improvement are being prepared by the Benham Engineering Co.

Clarinda, Ia., is to improve its WATER SYSTEM. Plans and specifications for the work are in process of preparation by the firm of Burns & McDonnell.

A SEWERAGE SYSTEM is to be built by Auburn, Me. The plans and specifications for the improvement are being prepared by the engineer, H. K. Barrow.

The city of Glens Falls, N. Y., has submitted to the state department of health a complete survey of the SEWERAGE SYSTEM, together with proposed extensions and improvements needed for relief. The engineering work was done by Henry W. Taylor.

A SEWERAGE SYSTEM, DISPOSAL PLANT and INTERCEPTING SEWER are to be built by Erie, Pa., at a cost of $800,000. Plans and specifications for the work are in process of preparation by the engineering firm of Gannett, Seelye & Fleming.

Municipal Journal

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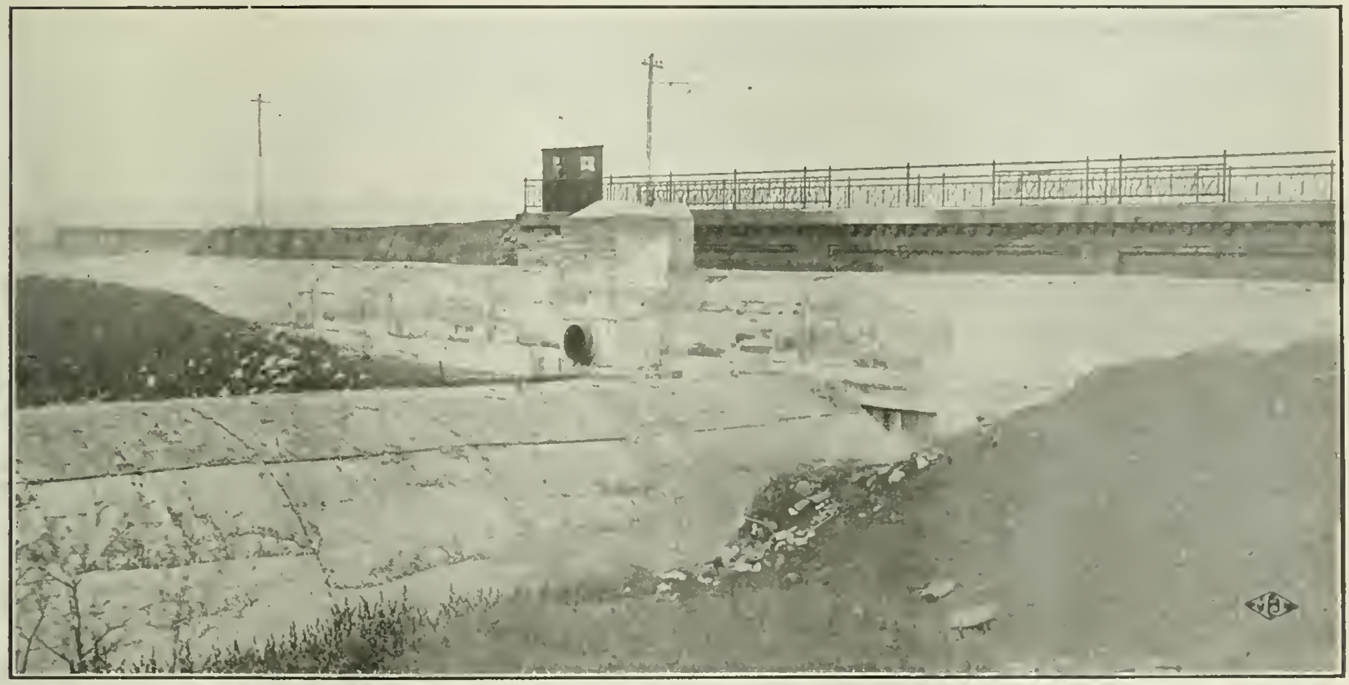
ST. LOUIS' NEW CONCRETE WATER CONDUIT

Provided to Supplement Old Conduit—Methods of Mixing, Placing and Reinforcing Concrete—Creek Crossings Supported on Piles—Equipment Used—Contract Prices.

By W. E. HARDENBURG.



CONDUIT CROSSING HARLEM CREEK SEWER. SHOWING 36-INCH DRAINAGE VALVE.

To increase the conduit capacity between the pumping station at Baden and the intake at Chain-of-Rocks in the Mississippi, the St. Louis water department is just completing a reinforced concrete conduit 3 1/2 miles long at a cost of somewhat over $200,000. This conduit, which possesses several unusual features in its design, was necessary to reinforce the old line, which had a maximum capacity of only about 90,000,000 gallons daily, while the estimated maximum draft in the summer is 102,000,000 gallons. With a storage at the Bissell's Point station of only 60 million gallons, which would be exhausted in about 5 days, the necessity of an additional conduit was clear. The old conduit, which was completed in 1892, is horseshoe in shape, 7 feet 9 inches high and 9 feet wide, with segmental granitoid finished invert, straight brick sides and semi-circular arch of brick, the invert being of concrete and the arch and sides backed with concrete. It is 17,930 feet long, built partly in cut and partly on fill and has a uniform grade of 1 foot in 10,000.

The proportions and reinforcement of the new conduit are fully shown on the accompanying drawing. This design was adopted only after estimates on many other types of conduit had demonstrated its economy under prevailing labor and material prices.

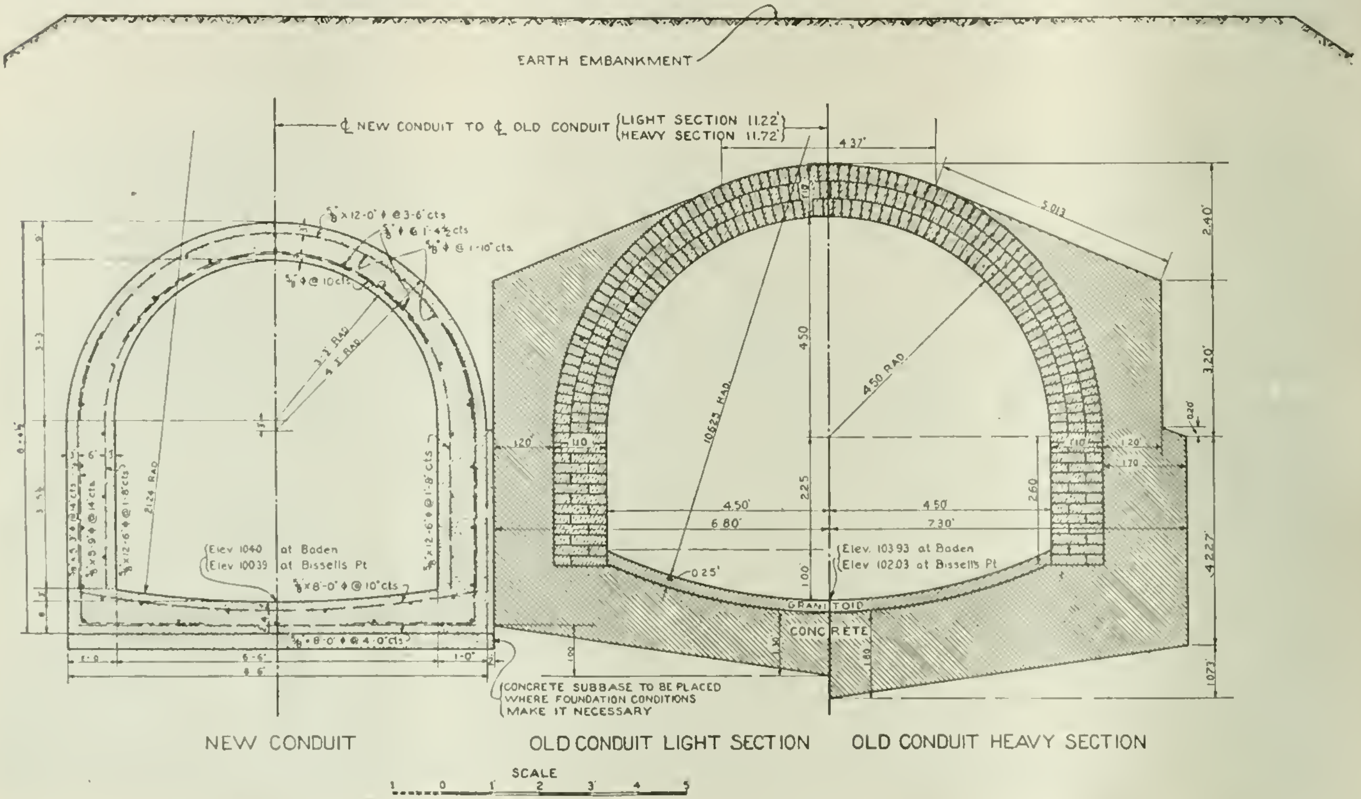
The new conduit parallels the old one, lying along the west side of it and with one wall built against it, except on the city property at Bissell's Point, where the two are 25 1/2 feet apart on centers. The new conduit, however, has a grade of 1 foot in 5,000 feet, and will carry 60,000,000 gallons of water a day when the old one carries 80,000,000. With the basins low, the combined capacity will be 160,000,000 gallons daily.

The new structure is connected with the old one at the Baden gate chamber (which is being enlarged and reconstructed), at the terminal chamber at Bissell's Point, and at the basins into which both empty. In addition, it is connected to a conduit supplying water from the basins at Bissell's Point to two high service pumping stations.

In its course, the conduit passes underneath the tracks of the Water Works' Railway, a municipal line running from Bissell's Point to Baden on a course roughly paralleling that of the conduit. The crossing is made underneath a reinforced concrete culvert, constructed in advance of the arrival of the conduit at that point.

Two gullies, Harlem and Horse creeks, each about 100 feet wide and each marking the course of a sewer, also were crossed by the conduit. The sewer at Harlem Creek is 17 by 30 feet; that at Horse Creek, 12 feet. In each case, the conduit is supported by a platform consisting of three staggered rows of reinforced concrete piles, the 20 odd piles in each row being spaced 10 feet apart, center to center, and the rows being 3 feet 3 inches apart, center to center. The interstices between the piles were packed with earth.

The piles averaged 15 inches in diameter and were driven to bed rock, the depth varying from 12 to 23 feet. The reinforcement consisted of six 5/8 inch longitudinal steel bars, stayed at intervals of 4 feet with circular bands of strap iron 1 by 1/4 inches and with a spiral wrapping of No. 10 steel wire with a pitch of 4 inches center to center, except at the head and point of the pile, where the pitch was reduced to 1 inch. The bars were 1 foot less than the overall length of the pile. The piles were driven in place with a No. 2 Vulcan steam hammer. Refusal was taken to mean more than 20 blows per inch.



SECTION OF OLD AND NEW CONDUITS, SHOWING THEIR RELATIVE POSITIONS.

The concrete for the piles was a 1:4 1/2 mix, except for two feet at the top and at the base of the pile, where it was enriched to 1:3 1/2. In all cases the piles were seasoned 30 days before being used.

The concrete in the conduit proper, except that used in laying subbase, etc., was composed of one part of standard Portland cement to a mixture of sand and aggregates of such proportion that one sack of cement was used in 4 1/2 cubic feet of concrete. The proportion of sand and gravel or crushed rock used varied, the mixture being generally 2 parts of sand to 1 1/2 of gravel. Ten pounds of hydrated lime were added for each sack of cement.

A rather wet mix was used, the specifications providing that it be mixed wet enough to require no ramming. The ingredients were mixed for three minutes, after all had been placed in the machine. After it was poured, the concrete was kept moist seven days. In pouring the concrete, great care was taken to maintain at all times not less than 2 inches of concrete between the centers of the outer reinforcing bars and the nearest bounding surface of the concrete.

The specifications for the reinforcing steel provided that the bars be rolled from either billet stock or sound rails (rails not to be used for bars more than 1 inch in diameter) and be deformed throughout their entire length while being rolled. The efficiency of the deformation was tested by embedding a specimen bar 5 inches in 1-2-4 concrete. It was required that, after 28 days, the bar sustain a load of 225 pounds per square inch of imbedded surface.

Each sample had to exhibit the following physical characteristics: Elastic limit, 50,000 pounds per square inch calculated on the specific section of the bar; cold bend, for bars under 3/4 inches, 180 degrees, and for bars 3/4 inches and over, 90 degrees, about a pin whose diameter is equal to 4 times the diameter of the specimen; elongation, minimum per cent in 8 inches, $\frac{1,000,000}{\text{ultimate strength}}$.

The concrete plant employed by the contractor consisted of two Ransome mixers of 1 yard capacity each and a Smith mixer with a capacity of 3/4 yard. The material was brought to the site of the plant over the railway along a switch paralleling the conduit and the concrete was shot directly into the forms. Horizontal layers of concrete in sections between 50 and 100 feet long, depending upon facilities at the different points, were poured at a time. At the end of each section, the concrete was stopped by a vertical bulkhead. On an average, 30 feet of completed conduit were laid per day, the highest figure reached being 400 lineal feet in a week, at a time when weather and labor conditions were favorable.

Special care was taken at all times to insure that the surfaces generally were smooth and free from both indentations and projections, while all exposed chamber surfaces were given a finish 1/2 inch thick, composed of 1 part of cement and 2 parts of sand, this finish being poured with the concrete.

The forms used in constructing the conduit along most of its length were Blaw metal forms. In short, curved sections, however, hand-made wooden forms of tongue and grooved timber, covered with sheet iron, were employed.

A considerable amount of masonry removal was required at the connections to the Baden gate chamber and the terminal chamber, the engine house conduit and the storage basin at Bissell's Point. The greater part of this masonry was limestone and brick, the engine house conduit being the principal reinforced concrete construction. Great care was required in this work, owing to the fact that it was necessary to keep the old conduit and the conduit chambers in service most of the time, only 4-hour periods being allowed for the placing of the bulkheads, stop planks, baffles, etc., and for their removal. Blasting was entirely prohibited, all the removal being done by drilling and the use of plug and feather and sledging. At several places the masonry on the west side of the old conduit projected into the new conduit wall more than 3 inches, the maximum permitted, and in these cases it was necessary to trim it down.

Though it had been expected that leakage would cause considerable trouble in excavating, little was found. The few leaks found in the old conduit were soon plugged. Heavy rains were the worst handicap, but in all cases a few small hand pumps furnished ample dewatering capacity.

Little difficulty was experienced in the excavation, the soil being uniformly a soft loam, mostly river deposit. For the excavation, a clamshell digger with a capacity of 100 cubic yards a day and operated by four men was employed, the average excavation per day being from 75 to 80 cubic yards. Excavation was not generally carried more than 50 feet ahead of the concrete, as a precaution against movement of the ground under the old conduit. When deemed necessary, wooden sheet piling was driven along the sides of the old conduit to insure against any such movement, this piling generally being left in place.

The back-filling was done by a drag scraper operated by 3 men, the conduit being covered to a depth of 3 feet on the average.

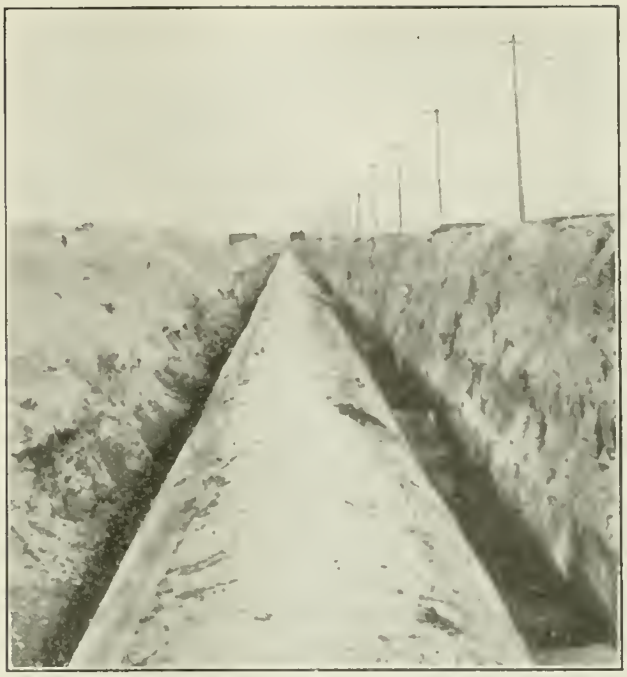
The embankment required was chiefly at Harlem and Horse creeks and at Bissell's Point. A large proportion of the embankment was made from the material excavated from nearby portions of the line. The free haul limit was 500 feet. The earth was hauled for the most part by wheel and drag scrapers, though wagons were used in some places.

The completed conduit, including the chambers and connections, was tested in sections of approximately 1,500 feet by filling with water under varying heads, in no case exceeding 5 feet above the top of the intrados, allowing it to stand and noting the leakage. The maximum leakage permissible was 3 gallons in 24 hours per lineal foot of conduit. The water for the testing was pumped from the old conduit, which has manholes at intervals of about 1,500 feet.

The gates were tested in place by applying full pressure alternately in either direction; the maximum allowable leakage with full pressure on the gate side being 5 gallons per minute, and with full pressure on the other side, 10 gallons per minute.

All the gate chambers are carried on reinforced concrete piles driven to bed rock, similar to those already described as being employed at the creek crossings.

At the Baden gate chamber, a 3 by 5-foot double gate previously in use was removed and a new 4 by 6-foot double gate substituted for it. Gates put in at Bissell's Point included a 6 by 7-foot, a 6 1/2 by 7-foot and a 3-foot circular gate, all being hand-operated. The gates were made by the Flower-Stevens Company of Detroit.


CONSTRUCTION VIEW OF NEW CONDUIT.

The city rendered considerable assistance to the contractor in the transportation of supplies and equipment. Between the hours of 8:15 a. m. and 4:45 p. m. of every working day, free haulage service on the Water Works' Railway was given to as great an extent as possible without interfering with regular traffic on the railway. All switches and sidings were supplied by the contractor.

The contract, which amounted to $232,172.50, was awarded to the Hagan Construction Company, a St. Louis concern. The official estimates of the work to be done and the material to be supplied, together with the contract prices for each follow:

Description	Quantities		Price
Earth Excavation...........	84,100	Cu. Yards..	$0.45
Embankment	3,350	" " ..	.45
Masonry Removal...........	90	" " ..	10.00
Concrete not Reinforced...	1,900	" " ..	6.00
Concrete in Conduit.......	15,850	" " ..	6.00
Concrete in Chambers, etc.	950	" " ..	8.00
Additional Portland Cement	100	Barrels......	1.70
Reinforcing Steel...........	1,800,000	Pounds......	.035
Sluice Gates and Appurtenances	Complete	....	5,800.00
Miscellaneous Cast Iron and Steel	55,000	Pounds......	.07
Reinforced Concrete Piles.	2,500	Lineal Feet.	2.00

Work was begun in September, 1916, and the job will be completed by spring, though shortage of labor and materials is delaying operations considerably.

Gurdon G. Black, engineer in charge of the Supply and Purifying Section of the St. Louis Water Division, directed the work under the supervision of Edward E. Wall, water commissioner.

Buy War Saving Stamps

MOTOR TRUCK ROUTES IN OHIO.

It is probable that early this spring motor truck lines will be in regular operation between Detroit and Cincinnati and between Chicago and Cleveland, the two routes intersecting at Toledo, which will be the headquarters of the company that is planning to operate the lines. The company proposes to put 50 trucks into the service at once and to add 100 more within 90 days if the patronage warrants it. It is believed that a regular service can be conducted covering the distance from Detroit to Toledo in 6 hours, from Toledo to Cincinnati in 18 hours, Cleveland to Toledo in 12 hours and Toledo to Chicago in 24 hours. All kinds of parcels will be carried and it is reported that traffic managers of a number of large concerns in the several cities have promised to patronize this service.

——Buy War Saving Stamps——

SERVICE STRENGTH OF SEWER PIPE*

Standard Methods for Testing Strength of Pipe to Resist Pressure from Back-Filling—Sand, Two-Point and Three-Point Bearings.

A standard method for testing the "ordinary supporting strength" of sewer pipe is needed urgently, in order that strength test results may be comparable everywhere, and in order that engineers may be able to determine before hand, by standard tests of sample pipe, whether the sewer pipe they are to use in any particular case will be strong enough to carry the loads from the ditch-filling.

The three main points which must be determined in devising a satisfactory standard test of the "ordinary supporting strength" of sewer pipe are:

1. What lengths of hub-and-spigot sewer pipe shall be used in calculating the "ordinary supporting strength" (per unit of length) from the test cracking load on the whole pipe.
2. What formulas and what sewer pipe dimensions shall be used in calculating the modulus of rupture of the pipe.
3. What bearings shall be used in applying the loads in making tests of the "ordinary supporting strength" of sewer pipe, and what are the ratios between the results obtained with the different bearings.

The net inside length of hub sewer pipe, from the bottom of the hub-socket to the extremity of the spigot end (excluding the hub), should be used as the divisor in calculating the "ordinary supporting strength" (per unit of length) from the test cracking load on the whole pipe.

The standard dimensions for hubs of sewer pipe ought to be such as will make the supporting strengths of the hubs (per unit of length) somewhat greater than those of the barrels.

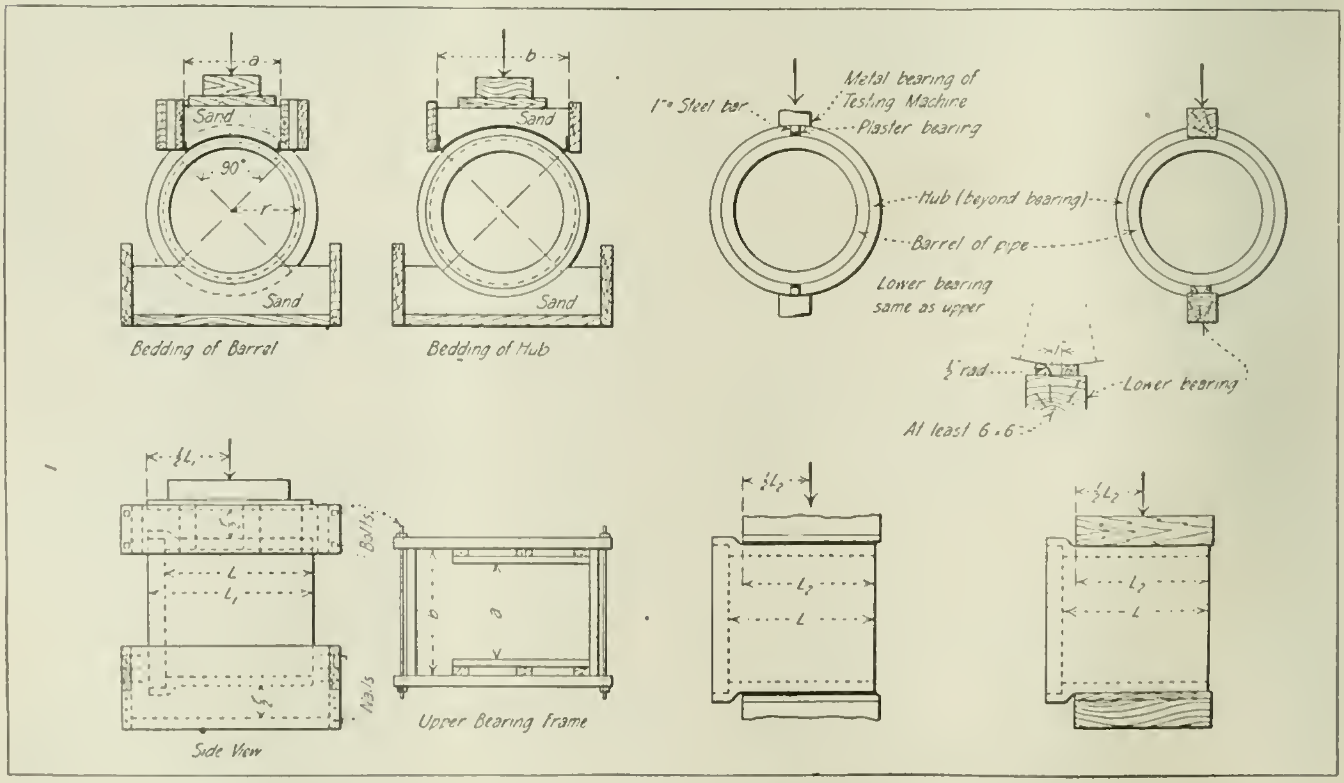
The modulus of rupture of sewer pipe ought to be calculated for the barrel of the pipe alone (excluding the hub), from its "ordinary supporting strength." (Formulas for calculating the modulus of rupture of sewer pipe from the "ordinary supporting strength" are given and fully explained.) Three types of bearings are in common use in making tests of the supporting strength of sewer pipe, and are designated, respectively, "sand" bearings," "two-point" bearings, and "three-point" bearings.

With "sand" bearings the sewer pipe is bedded for the tests (hub and all) in sand above and below for 90 degrees of the circumference of the barrel. This imitates closely the actual ditch-loading conditions. "Sand" bearings (with two other bearings) have been adopted by the American Society for Testing Materials since 1914 as standard for tests of the "ordinary supporting strength" of drain tile, and have been used for sewer pipe also in various laboratories, especially those of the Iowa Engineering Experiment Station at Ames, Iowa.

With "two-point" bearings, the load is applied through steel bars to strips one inch wide above and below the center line of the sewer pipe, with plaster of Paris between the steel bars and the pipe. The hub of tne pipe is not loaded at all with this bearing. "Two-point" bearings have been used extensively in testing sewer pipe for the city of Brooklyn, New York.

With "three-point" bearings, the load is applied to the top of the sewer pipe along a line over the center by means of a 6 inch by 6 inch wooden beam, and the pipe is

*Continued from page 168.



Sand Bearings. Two-point Bearings. Three-point Bearings.

BEARINGS RECOMMENDED FOR USE IN TESTS OF SUPPORTING STRENGTH OF PIPE.

supported below on two wooden strips, 1 inch apart in the clear, with rounded corners. "Three-point" bearings were devised by Professor A. N. Talbot, of the University of Illinois, and (with two other bearings) have been adopted by the American Society for Testing Materials since 1914 as a standard for drain tile. They have been used for sewer pipe also by several laboratories.

Two extensive series of comparative tests of the "ordinary supporting strength" of sewer pipe have been made at Ames, Iowa, by the Iowa Engineering Experiment Station, with "sand" bearings and "three-point" bearings, and "two-point" bearings also were used in the second series.

Tests with "sand" bearings, "two-point" bearings and "three-point" bearings are equally reliable so far as definiteness and uniformity of results are concerned, as is proven by studying the variations from the average and the proportions of regular breaks.

Tests with "sand" bearings gave direct, without the use of any multiplication factor, the "ordinary supporting strength" (which would be developed by the same quality of pipe in actual ditches with the "ordinary" pipe-laying method).

The cracking loads in tests with "three-point" bearings must be multiplied by 10/7 in computing the "ordinary supporting strength." In individual tests this ratio may vary quite a little, but the value 10/7 is well established by averages of a large number of comparative tests.

The cracking loads in tests with "two-point" bearings must probably be multiplied by 10/7 in computing the "ordinary supporting strength"; not enough comparative tests have been made to establish this multiplication factor conclusively, and those made give a somewhat lower average than 10/7, but this value is recommended, partly because of the general similarity of "two-point" and "three-point" bearings.

Standard specifications for tests of the "ordinary supporting strengths" of sewer pipe should permit the optional use of "sand" bearings, "two-point" bearings and "three-point" bearings.

"Sand" bearings have the advantages of reproducing the actual ditch loading conditions as nearly as practicable in a laboratory test, and of giving the "ordinary supporting strength" of the pipe directly, and probably with greater certainty.

"Two-point" bearings and "three-point" bearings have the advantage of greater rapidity and convenience in the laboratory, and the "ordinary supporting strength" of pipe tested can be obtained approximately by applying the multiplication factor 10/7 to the results.

Specifications of the American Society for Testing Materials for "sand" bearings for testing sewer pipe are as follows:

> When "sand" bearings are used, the ends of each specimen of sewer pipe shall be accurately marked in quarters of the circumference prior to the test. Specimens shall be carefully bedded for the full length of the sewer pipe, including the hubs, above and below, in sand, for one-fourth of the circumference of the barrel of the sewer pipe, measured on the middle line of the wall, bedding the hub to the same level as the barrel.
>
> The depth of bedding above and below the barrel of the sewer pipe at the thinnest points shall be one-half the radius of the middle line of the wall.
>
> The sand used shall be clean, and shall be such as will pass a No. 4 screen.
>
> The top bearing frame shall not be allowed to come in contact with the sewer pipe nor with the top bearing plate. The upper surface of the sand in the top bearing shall be struck level with a straight edge, and shall be covered with a rigid top bearing plate, with lower surface a true plane, made of heavy timbers or other rigid material, capable of distributing the test load uniformly without appreciable bending. The test load shall be applied to the exact center of this top bearing plate, in such a manner as to permit free motion of the plate in all directions. For this purpose a spherical bearing is preferred, but two rollers at right angles may be used. The test may be made without the use of a testing machine, by piling weights directly on a platform resting on the top bearing plate, provided, however, that the weight shall be piled symmetrically about a vertical line through the center of the sewer pipe, and that the platform shall not be allowed to touch the top bearing frame.
>
> The frames of the top and bottom bearings shall be made of timbers so heavy as to avoid appreciable bending by the side pressure of the sand. The interior surfaces of the frames shall be dressed. No frame shall come in contact with the sewer pipe during the test. A strip of cloth may, if desired, be attached to the inside of the upper frame on each side, along the lower edge, to prevent the escape of sand between the frame and the sewer pipe.

Tests made on vitrified clay sewer pipe at Ames, using sand bearings, gave the following results in pounds per lineal foot of barrel: 12-inch single-strength pipe (from Des Moines, Iowa); average—2,890, maximum—3,865, minimum—2,230. 24-inch single-strength pipe (from Des Moines); average—3,150, maximum—3,535, minimum—2,620.

Other tests on two makes of pipe, and on both standard thickness and double-strength, gave the following results: 18-inch pipe from Macomb, Ill.; standard—1,815 average, double-strength 2,600 average. 18-inch pipe from St. Louis, Mo.; standard—3,080 average, double-strength—4,100 average. 12-inch pipe from Macomb, standard—1,720 average. 6-inch pipe from Macomb—1,970 average.

——Buy War Saving Stamps——

MOTORCYCLE POLICE SUB-STATION.

The city of Detroit two or three months ago erected, as a sub-station of the Police Department, a small building known as a booth for the use of motorcycle police who are employed in guarding the outlying districts of the city. The first booth proved so valuable that the immediate erection of eleven more was decided upon. Six motorcycle police are detailed for duty at each booth, with two on duty during each of three 8-hour shifts. The two officers alternate with one another for two hours in patrolling the district and in answering emergency calls at the booth.

The outside dimensions of the booth are 8 by 10 feet, with an inside height of 8½ feet in the clear to the ceiling. A space 4 by 4 feet is enclosed for supplies, such as gasoline, oil, etc. The building is heated by means of an oil-heater. One of these booths is shown in the accompanying illustration. The "Gar. 1111" is the telephone number of the booth.

MOTORCYCLE POLICE BOOTH IN DETROIT.

STREET LIGHTING IN 1917*

Review of Developments in the Art and Practice—Illustrations from More Than Twenty Cities in All Sections of the Country.

Data obtained from twenty-six American cities indicate that lighting for illumination produced by units of moderate intensity and spaced so as to produce an even and continuous lighting effect is coming strongly into favor and replacing beacon or spectacular lighting by high-power units placed at considerable distances apart and usually high above the street or sidewalk level. Reports from more than 200 cities of the country, mostly those of small population, have been compiled[1] to show the progress in the adoption of modern machinery and types of lamps used in street lighting.

The reports of the Massachusetts Gas and Electric Light Commission may be taken as representative of street lighting practice in New England and indicate that changes are being made along the lines of the utilization of the smaller and more flexible types of illuminants. The advent of the gas-filled tungsten lamp has made available a line of lighting units flexibly rated from the smallest size to the largest size demanded and operating at an efficiency consistent with the size of the units. An analysis of practice in 110 New England towns, including some in Massachusetts, shows an increase in the use of magnetite arc lamps. The present number of carbon arc lamps is only one-third that of a few years ago, while the number of magnetites has nearly doubled. An increase has been noted also in the number of tungsten lamps below the 250-watt size. In fact, with the general increased use of the gas-filled tungsten lamp the ordinary enclosed carbon arc lamp has vanished to such an extent as to indicate its complete replacement either with the luminous arc lamps or the tungstens.

Attention has been called to the fact that more consideration should be given in street lighting to the effect of glassware and supporting fixtures, wires and poles, on the appearance of the street. In the past, most of the effort in street illumination has been directed toward improving the illumination in intensity and distribution and the production of more artistic standards. But in many cases, sources must be suspended and the location of the supporting wires and poles, the straightness of the latter and the lines of the former have not received much consideration from the standpoint of the looks or the artistic appearance of the street.

The trend of practice throughout the country may be gathered by reference to some of the following recent installations:

Spokane, Wash.—One hundred and twenty blocks are included in the new[2] lighting system in which magnetic arcs are replacing the old carbon arcs, about 500 lamps being involved.

San Francisco, Cal.—Just ten months after the lights were turned off at the exposition grounds, some of the same lamps were turned on when this city celebrated the inauguration of the new lighting system on Market street with an illumination parade. Nearly 9,000 feet of streets in a business section to be known as the Triangle District are to be lighted by luminous arcs mounted two to a standard, the latter to be ornamental in design and fitted with San Francisco gold carrara glassware. In Golden Gate Park, 112 25-foot wooden standards, designed to represent metal or concrete and carrying one 400-candlepower lamp with a bowl refractor, have been installed. Almost all of the old alternating current series arc lamps have been replaced throughout the city with gas-filled tungsten lamps fitted with band refractors. These new lamps have made it possible to grade the illumination to suit the location by the use of 250, 400 and 600-candlepower sizes.

Los Angeles, Cal.—For a new installation on eleven blocks of one of the main business streets it is proposed[3] to use two designs of lighting standards alternating in pairs. The system of lighting recommended uses luminous arcs spaced 115 feet apart, at an approximate elevation of 25 feet, where they will not interfere with window or sign lighting either by simultaneous contrast or otherwise. It has been aimed to combine modern floodlighting and utilitarian results with a slight suggestion of the Carnival. The soft tone of the glassware specified will be much less insistent than the present white glassware. The installation of ornamental lighting posts on the road leading up to Mt. Wilson has been decided on.

San Diego, Cal.—All arc lamps have been replaced with incandescent tungsten lamps of the gas-filled type, and of these there are 979 of the 600-candlepower size, used with refractors. The business district is illuminated by 539 five- and seven-light electroliers, containing 3,255 multiple tungsten lamps of the 60- and 100-watt size, and 159 single-light electroliers, containing 250-watt gas-filled tungsten lamps.

Salt Lake City, Utah.—The new "white way" lighting has been put in operation for a distance of five blocks covering the entire retail business district of one of the main streets. There are seven standards to the block on each side of the street approximately 100 feet apart. Each standard carries three 6.6-ampere inverted type luminous arc lamps. The lamps are equipped with diffusing glassware.

Kansas City, Mo.—An ordinance has been passed calling for the replacement of gas lamps with 250-candlepower gas-filled tungsten lamps, about 1,400 of which will be needed. The street lighting is to be extended to outlying sections of the city.

Denver, Colo.—In this city, ordinances have been submitted to the City Council for an ornamental system on 14th street, and for the installation of 274 new street lamps in the Park Hill district. In addition, two miles of new lighting are to be placed in the municipal parks. In order to add to the beauty of the business district, a bank has erected at its own expense a very ornamental lighting standard in front of its quarters.

Roundup, Mont.—A street lighting installation which is claimed to be typical of modern practice in the smaller communities in the West has been put in at Roundup. The series incandescent system is employed there, using 51 five-light cluster posts in the business section and 207 single-light posts in the residential district. One 100-candlepower and four 60-candlepower, 6.6-ampere lamps are used with the cluster poles, while 100-candlepower lamps are used with the single-light standards. In the business district the posts are spaced 91.5 feet apart, four to the block. In the residential section the staggered arrangement, with 122 feet between posts, is used.

At Minneapolis, Minn., at Milwaukee, Wis., and at Waco, Tex., additional improvements have been made in the street lighting.

Brownwood, Tex.—The plan of the business section and the consequent expense not warranting a "white way," a novel method of illumination was adopted. The store buildings have in most cases 25-foot fronts and the lights were hung under the awnings on 25-foot centers. A standard unit was adopted consisting of a 100-watt gas-filled tungsten lamp enclosed in an opal ball and hung from a weatherproof holder. Nearly 400 lamps were installed.

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*Part of a report by the Committee on Progress of the Illuminating Engineering Society.

[1] Municipal Jour., June 21, 1917, p. 811

[2] Municipal Jour., Oct. 26, 1916, p. 520.

[3] Municipal Jour., May 10, 1917, p. 659.

St. Louis, Mo.—In the report of the "Proceedings" of the 1916 convention of the American Gas Institute will be found a very good description of the extensive use of gas for street lighting in St. Louis as well as references to gas street lighting in Philadelphia, Baltimore, Charlestown, S. C., and Milwaukee, Wis.

Chicago, Ill.—In general, the extensions provided for by the big bond issue last year are being carried out, special attention being paid to four districts in particular. Two types of lighting equipment are being used: for business and car-line streets, 600-candlepower lamps mounted 22 feet above the street surface; for well developed residential streets where there are many trees, 100-candlepower lamps with low mounting height. All lamps are of the gas-filled tungsten type and those in the residential districts will be operated on low voltage as a precautionary measure. An interesting example of co-operation between property owners and the city to improve the street lighting is to be found in an installation on one of the business streets covering a distance of half a mile. This section was formerly lighted by 20 of the standard flame-arc lights supplied by the city. The property owners' association added 40 of the 500-watt gas-filled tungsten lamps in fixtures designed to conform with those of the arc lamps.

Additions to the boulevard and park systems are being made that will cover 8.75 miles. On the 5 miles of Michigan avenue which will be relighted, 320 double lanterns on cast-iron standards will be used. Four standards will be placed on the corners of each street intersection. Between the corners the posts will be staggered, allowing future expansion.

It is expected that by the time this report is presented the work throughout the city of making the change from arc lamps to the gas-filled tungsten units will be completed. The latter are of the 10-ampere street series, 600-candlepower, 6,000-lumen type, mounted on cast-iron fixtures in which special attention has been paid to the film cutout in the socket. Owing to the increased cost of tubular steel poles and the uncertainty of the time element in delivery, the city is considering a change from the standardized type of street lighting pole to an "equivalent" pole defined as "expanded steel-truss poles or concrete poles which may in the judgment of the commission * * * be equivalent."

New Orleans, La.—Installation of the new lighting system is under way. A specially designed ornamental street-lighting post has been made. Each post carries a 7.5-ampere, 250-candlepower tungsten lamp in a 16-inch globe. The posts measure 10 feet 10 inches in height, and will be spaced 90 feet apart. About 2,000 of these fixtures will be used on sections of the boulevards and principal avenues of the city. In the business section, double-lamp standards will be installed. Magnetite arc lamps, rated at 5.5 amperes, will also be used throughout the city, about 4,000 being planned for.

Elkhart, Ind.—A new street-lighting system has been installed. Single-lamp units are used of the reflector-refractor type, suspended 24 feet above the street and spaced about 15 feet apart.

Cincinnati, O.—Bids have been asked for the installation and equipment on 13 streets involving some 14 miles of new lighting. Nine hundred and thirteen incandescent lamps will be installed of the 20-ampere, gas-filled tungsten type, replacing 294 old arc lamps.

Springfield, O.—A new cluster light system has been installed,[4] consisting of 317 posts, and covering a distance of approximately 3 miles.

Titusville, Pa.—Since the series type of incandescent lamps would compel less change from the old carbon open-arc system, 150 of the 400-candlepower and 28 of the 600-candlepower tungsten units have been installed. One hundred and twelve units are supported on mast arms and the remainder on center suspensions.

Philadelphia, Pa.—The work of substituting gas for gasoline in more than 11,000 street lamps has been completed. The installation of 308 series, twin, electric arc lamps on Broad street completes the lighting of 8 miles of this thoroughfare comprising the entire paved portion. One hundred and fifty-seven lamp standards, each carrying a 100-candlepower series incandescent tungsten lamp, have been placed on the Southern Boulevard.

New Haven, Conn.—Fourteen ornamental gas lamps have been added to the lighting system.

New York City, N. Y.—At the end of 1916, 2,808 miles of streets and 10 square miles of parks were being lighted[5] by means of 78,540 street lamps. All arc lamps have been replaced, as well as 28,500 gas lamps and 1,292 naphtha lamps, by electric incandescent lamps of the best type.

Brooklyn, N. Y.—In the Ridgewood section, 1,000-candlepower series incandescent lamps suspended over the roadway and equipped with 10-inch band refractors are used at the street corners. Owing to the length of the blocks, 700 feet, 100-candlepower lamps with 8.5-inch band refractors have been placed at mid-block positions. In other sections of the city the wooden poles and overhead style of construction, for 60-cycle series lighting, will be replaced by iron posts with the cable carried underground.

Hoboken, N. J.—The new flaming-arc street-lighting system in the business section was placed in regular service in October. A new incandescent system comprising an installation of about 500 lamps was also officially opened in that month.

Baltimore, Md.—In the residential districts arc lamps are being replaced with ornamental gas lamps. This is in accordance with a plan to equip streets outside the business district with a standard lamp and remove the glare effect from residences.

Washington, D. C.—One hundred and seventy-seven of the 100-candlepower incandescent lamps have been installed with the improved type of post in the city proper, while 143 of the 60-candlepower size have been placed in the outlying districts. One hundred and forty-four mantle gas-lamps have also been added. A complete system of incandescent lighting has been installed on Maryland avenue.

Roanoke, Va.—A new lighting system has been put in[6] in which 430 of the old type of carbon arcs have been replaced by 800 gas-filled tungsten units.

Lincoln Highway.—A movement to light the entire extent of the Highway is being agitated among the Jovian Leagues.

Vancouver, B. C.—The old arc lamp fittings have been used to hold gas-filled tungsten lamps installed in place of the arc system. Six-hundred-candlepower lamps are used on car-line streets while on other residential streets the lamps are of the 400-candlepower size.

In England the war conditions due to restricted lighting have delayed the change, which had started before the war, from arc lamps to gas-filled tungsten lamps.

Edinburgh, Scotland.—The Covener of the Cleaning and Lighting Commission of the Edinburgh Town Council reported the success of a number of experimental tests with a pressure-wave system for automatically lighting and extinguishing the public lamps. As a result an initial equipment was placed on 65 lamps, and the effect was so satisfactory that it was recommended to the Town Council that 300 more be included. It is hoped by the use of this system to put gas-lighted areas on the same basis as those electrically lighted in enabling lamps to be quickly extinguished in case of air raids. Experiments have been made also in the direction of using low candle-power lamps at frequent intervals which, while giving low illumination as compared to pre-war days, will improve the general lighting condition.

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[4] Municipal Jour., Dec. 28, 1916, p. 814.

[5] Municipal Jour., April 5, 1917, p. 500.

[6] Municipal Jour., May 31, 1917, p. 746.

Glasgow, Scotland.—In Scottish towns generally the restricted lighting is being modified so as to allow of more lights in the streets. The whole question of street lighting in Glasgow has been under review in order to modify restrictions.

Paris, France.—In view of the possible shortage of gas for municipal lighting, the city council has agreed to experiment with kerosene to see what can be done with the humble oil *lamp à reservoir.* The Esplanade des Invalides is to be lighted by kerosene until further notice.

MOTOR TRUCK EFFICIENCY

Recommendation of Standard Method of Calculating on Basis of Cost Per Ton-Mile—Effect of Road Upon Efficiency.

In a paper before the American Road Builders' Association, R. E. Chamberlain advocated the use of standard terms for expressing the efficiency of motor trucks and the cost of motor truck service. The method of expressing such efficiency recommended was the cost per ton-mile. In order to compare such costs, it is necessary to standardize both the method of calculating total cost and the method of calculating ton-miles of service. "A committee of men experienced in the various phases of this problem are already working out a system to be known as the National Standard Cost System for Trucks. The present operating efficiency can never be greatly improved until cost figures of equipment operated under different conditions can be compared. We believe this will soon be possible."

The cost data available at present are very inaccurate and of wonderful variety. Truck costs should contain at least the items of interest on investment, depreciation or sinking-fund, insurance, taxes and licenses, drivers' wages, garage, fuel, lubricants, repairs and overhauls, and tires. Many, possibly the majority, of cost records of truck operation omit one or more of these items, some of them giving only drivers' wages and fuel. In order to make a comparison which shall be of any service, however, all of these items should be included.

In calculating the ton-miles of service, Mr. Chamberlain recommends that this be the product of the tons of load carried, times the distance over which it is carried. This allows nothing for distance covered with an empty truck. If a truck carried a succession of loads in one direction, returning empty each time, its ton-mileage would be only one-half as great as would be the case if it returned each time with a full load. Under such a condition, its efficiency would be said to be 50 per cent. The ton-mile capacity of a truck is the total distance covered by the truck in a day times the maximum load which it could have carried. The efficiency of the truck is the percentage which the ton-mileage of service actually performed is of the ton-mile capacity. Some recent traffic analyses have shown an operating efficiency of not above 37 per cent. If the ton-mile cost at 100 per cent efficiency would be 6.7c, a 37 per cent efficiency would give a ton-mile cost of approximately 18.1c. Conditions have been analysed where there was but 18 per cent efficiency, and the ton-mileage cost was 37.2c.

Mr. Chamberlain discussed the effect of road conditions upon truck efficiency, taking the resistance of a surfaced concrete road at 50 pounds per ton as the standard. Experiments made in California showed that a gravel road in good condition offered 82 pounds resistance and an earth road with dust offered 99 pounds. Assuming that a 3-ton truck is able to make 7.2 miles per hour on the standard road, its speed with the same load on gravel would be 4.8 miles per hour, and on earth, 3.6 miles per hour. If the truck runs 7 hours a day, the relative costs per ton-mile would be as follows: Surfaced concrete—16.3c; gravel—19.4c; earth—20.7c.

There are in use in the United States about 400,000 trucks of all capacities. Assuming them all to be of 3-ton capacity, that they work 300 days a year and average 30 miles a day, each of the trucks, if 30 per cent efficient, would produce 13,500 ton-miles a year; or a total for all the trucks of 5,400 million ton-miles. If we multiply this amount of ton-miles by the costs per ton-mile on the different surfaces, we find the costs of the three types to be respectively, $880,200,000, $1,047,600,000, and $1,117,800,000. There can be calculated, on the basis of these figures and the amount of trucking done on a gravel or earth road, what the theoretical saving would be in changing the surface of this road to one that offered less resistance.

EFFECT OF BOULEVARD ON PROPERTY VALUES.

Philadelphia has opened a boulevard from Broad street northeast for a distance of seven miles, no part of the cost of which either for land or for the improvement has been assessed against benefited property, although the selling values of adjacent property began increasing rapidly as soon as the project was definitely decided upon. Concerning this, Chester E. Albright, chief engineer of the Bureau of Surveys of Philadelphia, made the following statement in his annual report:

"The influence of the Boulevard as a creator of values has been directly felt over an area of more than 20 square miles. The assessed value of properties abutting upon and lying near it along its entire length has increased from 50 to 800 per cent, and actual selling values have increased in a far greater percentage, yet these properties contributed nothing toward the improvement, but received damages based upon new values created by it. It seems quite clear that a considerable part of this expense might have been assessed against benefited property in the vicinity, that the drain upon the public treasury might have been greatly reduced, and yet a very large margin of the profit allowed the land owners. As a matter of fact, the owners in the vicinity received all the benefits and the taxpayers in remoter sections of the city, who received little or no benefit, paid all the bills.

"Every city that has carried out improvements of this kind furnishes the same evidence of accrued benefits to property in the vicinity, and many of them have appropriated a part of the increased value to offset the cost through the medium of assessment for benefits.

"There is also abundant evidence that the creation of parks is a stimulus to increased land values and other benefits in their vicinity. It is an almost invariable rule that property in the immediate vicinity of a park is much more valuable than that further removed from it, and the same is true of parkways."

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Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

POSSIBILITIES OF TRUCK TRANSPORTATION.

In a discussion at St. Louis, before the American Road Builders' Association, of the use of motor trucks for relieving railroad freight traffic, one of the members expressed his doubt of the possibility of substituting truck transportation at 6c a ton-mile for railroad transportation at less than 1c per ton-mile, especially since the latter figure includes interest and depreciation on the cost of the road-bed, while the former does not consider cost of building and maintaining the road over which the trucks travel.

This speaker apparently overlooked the fact that the truck transportation is to be used only for short hauls, probably less than 150 miles; also that the terminal charges are not included in the freight cost per ton-mile, or if so included form but a small part of the long-haul cost, whereas for short hauls they amount to much more than the cost of the railroad transportation. Moreover, the cost of handling at the terminals and delivering at package rate from terminal to destination is to be added to the railroad charges, whereas it is included in the cost of motor truck service. The comparison, therefore, should be made between motor truck service on the one hand and combined railroad service and terminal and delivery costs at both ends on the other. This was illustrated by the delivery of eggs from certain New Jersey communities to New York. By motor truck the eggs were handled but twice, or at most four times, while by train service they were handled as many as fourteen times in some cases. Each handling cost money and subjected the eggs and packages to possible damage. The delivery by motor trucks is daily, a round trip being made each day, while by train, the eggs are on their way two days.

While there may be some truth in the claim that thus far the cost of good roads and of maintaining them has not been included in the cost of motor truck transportation, it is not more than partially true. By the Illinois plan, the automobile fees are to pay the cost of building the main roads, and when they have been built will pay the cost of their maintenance. If, therefore, the proper charge is made for the motor truck licenses in estimating the cost of operation, the interest and sinking-fund charges to cover the cost of road construction are certainly included, and probably the major part of the annual maintenance cost.

Until the development of the motor truck reaches the state where the cost of the service is standardized, by standardizing designs, speeds, methods of collecting and delivering freight from purchaser to consumer or retailer, the benefit to the people along the roads will be great enough to off-set any question of value of the roads. For example, Mr. Neal of North Carolina said that the farmers in his county raised enough produce to feed all the people living in the country, but the roads are so bad that the products cannot be delivered at the local market centers when they are needed. As a consequence, food must be shipped to those centers from outside. There would seem to be no question that the farmers would gladly contribute the cost of good roads in return for a part of the benefit that they would derive from the new system. The consumer also would receive a part of the benefit in the form of a saving in long hauls of produce from outside the district as well as in the cost of the short hauls from the farm to the market center.

SETTLEMENT OF PIPE SEWERS.

In this issue will be found an article describing a method developed by theoretical considerations, checked and supplemented by practical investigations, for determining the pressures that come upon sewer pipes laid in trenches, and the ability of such pipes to withstand these pressures without cracking.

Aside from the value of the methods and coefficients presented therein, there are two features of sewer laying that are suggested thereby. One of these, which is referred to briefly in the report, is the fact that no amount of ramming of earth between the sides of the trench and sewer pipe laid therein will prevent such sewer pipe breaking by settlement of the arch due to the superimposed load, since the pipe will probably crack along the sides before its horizontal diameter has increased more than one-fiftieth of an inch, whereas the most solidly rammed backfilling cannot be relied upon to prevent a horizontal movement considerably greater than this under much less pressure than that developed by ordinary backfilling pressures. This does not mean, however, that there is no advantage in thoroughly ramming the backfilling at these points, since such ramming will ordinarily prevent the collapse of the sewer even though it may be cracked. The authors of the report state that there are probably many miles of sewers that are giving good service, although many of the pipes therein have cracked, but have not collapsed.

Another point suggested, but not referred to, is the probability of settlement of the sewer pipes under the load of the backfill and the effect of such settlement on the joints. Probably only a small percentage of the pipes laid in any sewer are bedded solidly on the original soil, but in the majority of cases the trench bottom has been cut from one-fourth of an inch to one inch lower than is necessary and the pipe is then raised above the natural soil by a layer of earth or (if the engineer and inspector are not sufficiently diligent in securing good work) by a stone or stick placed under the bell-end of the pipe. Possibly the best construction practicable without the use of a concrete cradle would be to use sand or fine gravel for bedding the pipe.

We learn from the report referred to that when pipe is laid in accordance with good practice, a pressure is exerted on each lineal foot of pipe amounting to about 1,500 to 2,000 pounds for a trench having the average dimensions of two feet wide and eight feet deep. In the case of an 8-inch pipe, this pressure is supported by about two-thirds of a square foot under the best conditions of laying, and in many cases by as little as one-sixth to one-tenth of a square foot. That is, the load supported by the bed of the pipe will perhaps ordinarily range from 3,000 to 20,000 pounds per square foot. It seems almost certain that where the pipe is bedded in material other than the firmest of natural soils this pressure, due to the weight of the backfilling, will produce more or less settlement. This, unless the backfilling is a fairly clean, dry sand, will not take place at once, but may be delayed until a rain thoroughly saturates it. At any rate, it is almost certain that the full pressure will not be exerted upon the pipe until long after the cement joints have set. If all of the pipes settled uniformly there would be little danger to the joints; but it can hardly be supposed that uniform settlement will occur, since this would be possible only if the bedding under the pipes was uniform in both thickness and character of material throughout the sewer, and the pressure upon the pipes was uniform also. If the various pipes settled different amounts, the results could hardly fail to be a greater or less opening of the joints.

If we consider the reprehensible but too common practice of raising the sewer pipe by placing small stones or pieces of wood under one end, the condition is much more serious. If we assume a piece of stone or wood 3 inches square supporting one end of a two-foot length of pipe, we have approximately 2,000 pounds supported on an area of 9 square inches, or 32,000 pounds per square foot. Moreover, this pressure is exerted near the edge of the bellhole, where the soil is much more liable to yield than elsewhere. Under this condition there would seem to be no question that there would be a settlement of the bell unless it were supported by the spigot of the next pipe, in which case there would be a tendency for the top of the bell to be broken off, permitting the pipe to settle and producing a much more objectionable condition of joint than that previously referred to.

These considerations would seem to give additional force to the arguments for carefulness in grading the bottoms of sewer trenches and bedding pipes therein; also to suggest a further advantage of joints made of bituminous or similar flexible materials which would allow a slight movement of the pipes in settling without either causing leaky joints or breaking the bells of the pipes, unless the settlement of the bell-end considerably exceeded that of the contained spigot or vice versa. It also emphasizes the advantage of bedding sewer pipe in concrete saddles, thus distributing the load uniformly over a bottom of undisturbed natural soil.

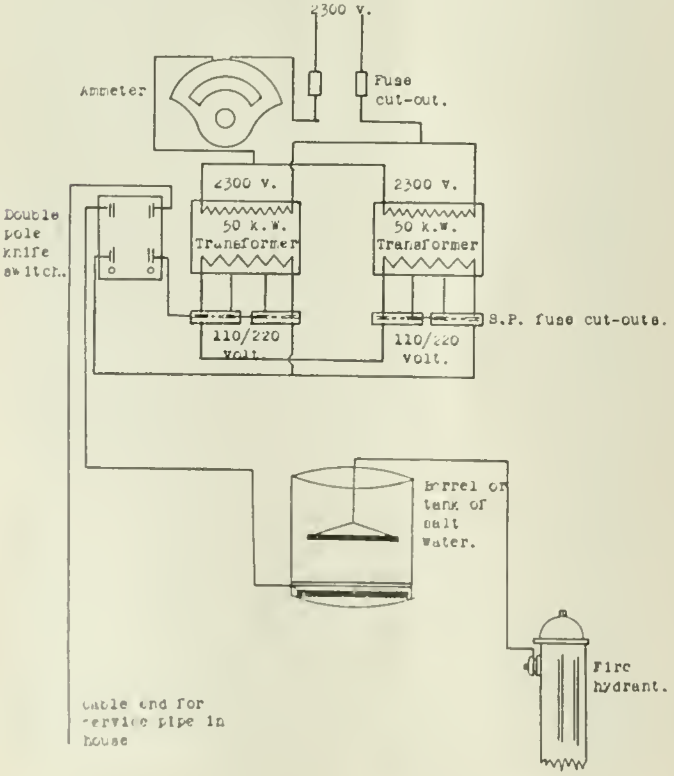

DIAGRAM OF ELECTRIC THAWING APPARATUS.

IN RECOGNITION OF OFFICIAL ECONOMY.

"In carrying out the provision of this resolve they may expend a sum not exceeding five thousand dollars."—General Court of Massachusetts, Resolves of 1917.

"No part of the appropriation under which this investigation was made has been expended." Henry P. Walcott, chairman, Metropolitan water and sewerage board; A. J. McLaughlin, commissioner of health, State Dep't. of Health; Edward F. Murphy, commissioner of public works of the city of Boston.

These two quotations from a report on the "Discharge of Sewage into Boston Harbor," dated January 9th, 1918, indicate a desire to economize in the expenditure of public money that is as commendable as it is rare.

THAWING FROZEN WATER MAINS

Method of Using Electricity at North Attleboro for Thawing Pipes Varying in Size from Small Service Pipes to Six-Inch Mains.

By WILLIAM PLATTNER.*

The Water Department of North Attleboro, Mass., like a majority of the water works departments in New England, has experienced the most severe winter known. The frost has penetrated to a depth from 3 ft. to 6½ ft., depending on the nature of the soil. During the past several weeks, starting Dec. 24th, 1917, several water service pipes one-half inch, three-quarter inch, one inch, and two inches diameter have frozen, and late in January, 1918, 6-inch cast-iron water mains froze. The water department had a similar experience in 1912, when the frost penetrated to a greater depth than had been known up to that time; but in 1912 no 6-inch pipe was found frozen.

In 1912 the writer made up an electric thawing apparatus, consisting of a 20 kilowatt transformer, 2,300-volt primary and 110 and 220-volt secondary, this being an ordinary lighting transformer. This worked very satistorily for all pipe up to 2-inch, and has been in use each winter since then.

During the past winter the frost reached not only to the service pipes supplying residences, stores and factories, but to 6-inch cast iron water mains and 6-inch branch pipes leading to fire hydrants. In the majority of cases where water could not be gotten through the hydrant, it was found that the branch pipe leading from the main to the hydrant was frozen, but the main itself was clear because the circulation of water through it kept it from freezing.

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*Manager of Electric Light and Water Departments, North Attleboro, Mass.

The Water Department, under the supervision of the writer, was equipped during the past winter to thaw out any size pipe up to 8-inch, including 7-inch barrel hydrants, and the apparatus has worked out satisfactorily.

The illustration shows a 3-ton Velie truck with the following equipment: Two 50 kilowatt General Electric Co. lighting transformers, 2,200 volt primary and 110 and 220-volt secondary; an ammeter, General Electric Co. make, 0 to 100-ampere reading, located at the top of transformer and connected on the 2,200-volt side of the circuit. On the front of the transformer, where the secondary or low-voltage cables are located, there are mounted four single-pole, 600-ampere fuse blocks, used for changing voltage from 110 to 220 or vice versa, and the 110 and 220-volt wires are connected to these blocks. Instead of fuses, heavy copper bus bar blades are used. The changing of the bars to get the desired voltage is made while the current is shut off.

A large double-pole, single-throw knife switch is mounted at the top of the left transformer, as shown in the illustration, which disconnects all low voltage electricity to cable running into the house and fire hydrant. 2,200-volt electricity is carried to the transformers on the truck and connected to General Electric Co. primary cut-outs, which are located on the opposite side of the truck, as shown in the view. No fuses are employed in any part of the equipment. Current to the extent of 100 amperes on the 2,200-volt side has been drawn through the transformers.

One low-voltage cable is connected (see diagram) to a cast iron flange which is located in the bottom of an oil barrel, the barrel being half filled with water containing 4 lbs. of common table salt. The top cable coming out of the barrel is used to regulate the flow of current. On this cable is bolted another cast iron flange 16 inches diameter and 1-inch thick, which is lowered or raised by the hand of the man operating it and who at the same time observes the ammeter on the transformer which indicates the amount of electricity in amperes flowing. If he is thawing with 110-volt electricity, he simply multiplies the ammeter reading by 20 (the ratio of transformer being 2,200 to 110 volts) which give him approximately the current on the secondary side of the circuit; and if the 220 volt is used, he multiplies by 10. By keeping the ratio of transformation in mind, he can readily at a glance determine the flow of current he is using.

The 110-volt electricity is used on short services and the 220-volt on long services.

The two reels on top of the truck shown in the illustration contain 1,500 ft. of twin flexible insulated stranded cable. When customers with frozen services are beyond reach of the 2,200-volt primary circuits of the town's lighting system, then the twin conductor cable is laid on the ground to the truck.

The three bottom reels contain 1,200 ft. of No. 00 stranded weatherproof cable. This end of the cable is carried into the house and wound around the pipe, to make a good connection with the pipe to be thawed. The other end of the cable is connected to a short cable coming from the double-pole switch. Two bolt guy clamps were used in connecting the cable together.

The end of the cable coming out of the barrel is fastened under the cap of a fire hydrant, thereby completing the circuit through the water main and the house service pipe. (See diagram).

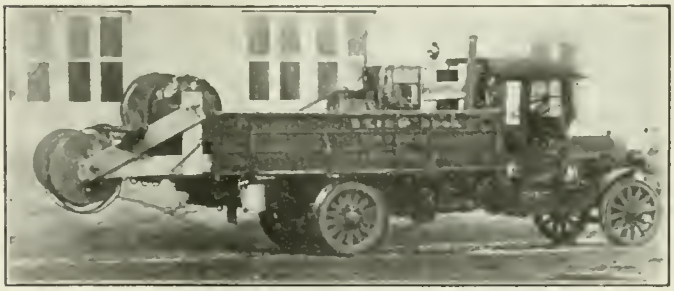
After the electricity is brought to the transformer in the truck, the main switch is thrown in. Then the top cable with the cast iron flange is lowered into the barrel containing the water; the further this is lowered into the barrel (thereby bringing the upper plate near the lower plate) the greater will be the flow of current.

Great care must be taken to allow for the kind of pipe to be thawed. An old, plain iron or galvanized pipe can not withstand as much current as a new pipe of a similar size, on account of the deteriorated condition of the threaded joints, unions and couplings, etc., which might burn the pipe off due to unusually high resistance.

Lead service pipes of ¾-inch diameter require approximately 300 to 500 amperes of current, while plain iron or galvanized or cement-lined iron requires from 150 to 400 amperes, depending upon the size and condition. The time required to thaw such pipe is about 5 to 15 minutes and in some cases 20 minutes. Six-inch cast-iron water mains require 500 to 800 amperes and in some instances 900 amperes. Six-inch and 7-inch barrel fire hydrants, which is the ordinary 2-way or 3-way 2½-inch nozzle type, require from 500 to 900 amperes.

In one instance it took only 15 minutes to thaw a 6-inch cast iron water main, current flowing through the pipe 800 amperes at 110 volts. In another instance it required 1 hour and 10 minutes with a current of 500 amperes and at times raised to 600 amperes at 220 volts; and another 6-inch main required 3 hours and 45 minutes with a current of 500 to 600 amperes at 220 volts. The difference in the time required was undoubtedly due to the fact that some of the mains were frozen a greater distance than others.

We also thawed 300 feet of 3-inch wrought iron steam pipe line running between two factories in 15 minutes at 450 amperes at 110 volts. In another case we thawed a 5-inch cast-iron sewer pipe running between two buildings, the time required being 45 minutes with a current of 540 amperes at 110 volts; the cable being connected or twisted around the iron pipe in one of the buildings and the other end of the cable on the sewer pipe in the other building.



TRUCK CONTAINING THAWING APPARATUS.

Our crew consists of 9 men as follows: 2 on truck operating main switch and cable in the barrel; 1 lineman who connects all wires to the 2,200-volt lines; 1 hydrant man, who sees that the cable is properly secured under the cap on the nozzle and sees that a good contact is made; 2 men in the cellar to connect cable on the pipe to be thawed and also inspect all piping as to joints or whether the water pipes are resting on gas pipes or come in contact with any other underground structure; 3 men to pull cable and guard same when laid in the streets and also to guard the high-tension, 2,200-volt cable. With the above outfit we have thawed as many as 32 services in one day, and in each instance thawed out an average of three consumers to a "hitch." The frozen service pipes were not confined to any particular locality in the town, but pipe was found frozen in remote sections of the town as well as in the congested district. More services were found frozen in coarse gravel and ledge and rocky soil, where the frost penetrated to a depth of 6½ feet, than in hard pan and clay soil, where the frost penetrated only to a depth of 3 to 4 feet. The average cost, including depreciation on cable (which runs high in such cases) and all other charges, was approximately $8.00 per service.

The WEEK'S NEWS

State Highway Developments in Idaho, Texas and Oregon—Repairing New York's Streets—U. S. Public Health Service's Anti-Malaria Operations—Typhoid Reduction in Ohio—Power Rates Increased in Philadelphia—President Wilson and Secretary McAdoo Discuss Public Utility Conditions—Firemen and Police Get Higher Pay in Two Cities—Dayton's New City Manager—Equalization of County Taxes in New York State.

ROADS AND PAVEMENTS

Only "Necessary" Roads in Idaho.

Boise, Idaho.—Engineers from the forest service and from the United States Office of Public Roads have been in conference with members of the state highway commission on highway work being done in Idaho. It was agreed that the forest service would co-operate with the state in building only such roads as are necessary for use in transporting war materials and foods in 1918. Work will be carried forward on the Sawtooth park highway, which leads over Galena summit into the Custer basin country in south Idaho; on the Fourth of July canyon, in Kootenai county, and on a stretch of highway which connects Kooskia and Lowell in Idaho county. It was agreed that nothing would be done this season on the Yellowstone park highway by the forest service, since the road is not valuable for military purposes. Some valuable mines are located in the Salmon river country, north of the Sawtooth range, and since metals taken from them must be hauled overland to Ketchum, the closest railroad point, it was agreed that there is an immediate demand for a minimum grade over Galena summit. The two other roads also reach important mining properties. Idaho's forest service appropriation for the year beginning July 1, 1918, is $104,700.

State Highway Commission Held Constitutional.

Austin, Tex.—The constitutionality of the law creating the state highway commission has been upheld by the third court of civil appeals in the case of P. S. Adkins against Curtis Hancock, chairman, et al., from Travis county. The case was heard by a special court. The contention of Adkins was that the law was a tax and could not be collected through the medium of a commission. It was insisted by the commission that it was a license fee and could be collected under the police powers of the state.

War-Time Road Program of Oregon.

Salem, Ore.—War conditions will directly affect the road building policy of the state highway commission in 1918. The program for active work has been materially changed for the present year by the commissioners along two main lines: Road work to be confined almost exclusively to the trunk lines of the state; practically no paving save what can be laid by the state's own paving plant. A great increase in motor truck traffic is looked for because of railroad conditions. The trans-state roads are to be used as main arteries. With the state pushing through these main roads the feeders will be taken care of by the respective counties. Many counties and road districts have substantial sums of money for road work and this money will be devoted to placing in shape the lateral roads leading to or connecting with the trunk lines. The main roads will connect the principal markets of the state and motor trucks can move from town to town with freight. The greatest amount of mileage for the money available is the intention of the commission. Increased mileage can be obtained by the use of macadam and gravel, preference being given to one or the other of these materials, depending on availability of supply, with regard to location of the work being performed. In this connection the commission takes into consideration that the courts have held that a "hard surface" pavement is not necessarily the smooth, finished surface, but includes macadam and similar material. There are a number of paving contracts which were let last autumn and which have not been completed. These will be carried on as the contracts provide, but aside from these no new paving projects are contemplated other than such paving work as can be handled by the state's own plant. This state plant will probably be located in the Willamette valley, on the Pacific highway, possibly somewhere in Marion county, between Salem and Canby. By June, unless something unforeseen occurs, the main obstacles on the Columbia River highway, between Hood River and Astoria, will have been eliminated. These are heavy grading jobs, the principal ones being in the Cascade mountains, where it is all rock work. Beyond The Dalles a gravel road will extend into Umatilla county by the end of the year, and it is possible that that time will also see the connecting link between Hood river and The Dalles available for traffic. Thus before 1918 is over the east and west main artery across Oregon will be opên. Contracts for the big grading jobs on the Pacific highway, between the California line and Portland, have been let, and should be completed during the summer. These take care of the worst spots and will open the north and south artery to traffic. Many counties which were expecting assistance from the state in 1918 will be compelled to wait. The main roads must be pushed to completion first and then such other main roads as are necessary to connect up important parts of the state.

Lincoln Highway Improvement in Indiana.

Indianapolis, Ind.—The state highway commission has appropriated $73,500 for the improvement of the Lincoln Highway in Allen county following the appeal of the Section on Co-operation with States of the Council of National Defense. Members of the state highway commission have been in Fort Wayne recently completing details in connection with the work of construction which is to be started early in the spring. Conferences have been held with county authorities and plans and specifications for the work to be undertaken are being filed. The work to be undertaken will cover all of the unimproved sections of the Lincoln Highway in the county outside the corporate limits of the towns and villages. It is anticipated that the work in question will result in the permanent improvement of the Lincoln Highway from the Ohio state line on the east to the Noble county line on the west. It is the plan of the state highway commission to further its improvements upon the main through connected roads of the state, favoring those interstate in character. In the carrying out of this plan the Lincoln Highway has been termed a "main market road," and in consequence will be one of the first to receive state aid, as the improvements in Allen county indicate.

Repaving in New York City.

New York, N. Y.—Frank L. Dowling, president of Manhattan borough, recently made the announcement that he was preparing to spend $2,800,000 repaving Manhattan streets. Business interests have been urging for months that the marginal thoroughfares on the east and west sides in front of the piers be improved at once. In many places there are so many ruts that trucks have been seriously damaged delivering goods. "These marginal ways present a peculiar condition," said Mr. Dowling, "because the dock department has charge of half of the street next to the docks and the other part is in charge of the borough president. The paving should be under one control, and I have asked the corporation counsel for an opinion regarding the borough president taking entire charge of repaving those streets. If he holds that the borough president has not the legal right to do all the paving, it will be necessary to go to the legislature and have this detrimental division of street paving authority along the river front removed. We could easily use $5,000,000 for repaving the streets of Manhattan," added Mr. Dowling, "but the Board of Estimate is not inclined to spend much money, and we will have to get along with about half that amount. Motor trucks are getting heavier all the time and destruction to pavement is greater than a few years ago. The result will be that we will have to get an entirely new type of pavement or limit the weight of vehicles. I should like to have suggestions from the motor truck men as to some wheel or tire width that would not cut pavement."

SEWERAGE AND SANITATION

Anti-Malaria Work of U. S. Public Health Service.

Washington, D. C.—Secretary McAdoo announces that the United States Public Health Service of the Treasury Department has practically completed plans for preventing malaria among soldiers at camps and cantonments during the coming spring and summer. In a zone from one to two miles wide around twenty or more camps in the South every known effective method of eradicating the disease will be employed under the supervision of experts. In the camps themselves the Army authorities will control the disease. In the past the Public Health Service has supervised demonstrations which have proved beyond question that its methods are effective. They are similar to those which made possible the building of the Panama Canal after eradicating the yellow-fever mosquito. Measures against the disease are designed either to eradicate the Anopheles variety of mosquito or to prevent persons from infecting them or being infected by them. As other varieties of mosquitoes will incidentally be eradicated, not only will malaria be prevented, but the mosquito as a pest will be driven from the vicinity of the camps. At each camp where there is danger of malaria an expert, probably a sanitary engineer, will be in charge of the malaria operations. He will be supervised by Public Health Service experts who know malaria prevention to the ground. The plans contemplate a survey of the area around the camps. The proper zone for malaria work, the amount of malaria occurring in the previous year, the breeding and hiding places of malaria mosquitoes, and the best methods of prevention in the particular zone will be determined.

Court Upholds Right to Require Vaccination.

San Antonio, Tex.—The right of the board of education to require vaccination as a pre-requisite for admission to the San Antonio public schools was sustained by the fourth court of civil appeals in an opinion given in the case brought by five residents of San Antonio against the board of education. They protested at the action of the school board, which issued a ruling that no child would be admitted to the public schools unless the city health ordinance had been complied with. A provision of the city health ordinance stipulated that no child should be admitted to the public schools who was not able to show a certificate from some registered physician that such child had been vaccinated against smallpox within the last preceding six years. In their petition the appellees held that vaccination is loathsome, terrible and dangerous, as well as likely to permanently impair the health of the patient or cause the loss of the member of the body vaccinated, or the death of the individual. In the opinion of the fourth court of civil appeals the state law, passed by the thirty-fifth legislature, creating the San Antonio independent school district, gave that body the management and control over such schools, and points out that the board thus created has the power to set up the qualifications for admission. The point made by appellees that their children are denied equal rights under the law is denied. It is held that this power for the control of the schools is conferred on the board, not on the parents, no matter how correct their conscience, convictions, faith or religious beliefs may be. Reference is made to another case, previously decided in the supreme court of the state, and which was appealed from here, in which the right of a former board to require vaccination of pupils before they would be admitted to the schools was sustained. It is held, under that decision, that the present regulation is a reasonable one and that the opinion of the lower court should be maintained.

Water Purification Reduces Typhoid in Ohio.

Columbus, O.—How cities can reduce their typhoid death rates by purifying their water supplies is demonstrated in typhoid statistics for a group of seven Ohio cities given out by the state department of health. These cities are Alliance, Ashtabula, Bellaire, Cincinnati, Columbus, Portsmouth and Steubenville. All have improved their water supplies in the last ten years and all have shown immediate drops in their typhoid death rates shortly after such improvements have been made. Cincinnati and Columbus, both of which put improved water systems into operation in 1908, offer the most striking evidence of the value of purification plants. Before 1908 Cincinnati's deaths from typhoid fever were averaging just under sixty per 100,000 population each year. Since 1908 the average rate has been 8.1 per 100,000, representing a decrease of 86 per cent. Columbus, before her plant began operations, was losing on the average 77 persons per 100,000 population each year to typhoid fever. In one year, 1914, the Capital City had the high rate of 147.7 per 100,000. With pure water the rate has fallen to a yearly average of just over sixteen. In Alliance water purification, installed in 1913, has brought the average yearly typhoid mortality rate from 33 to 20. In Ashtabula a change in 1909 has lowered the figure from 68 to 25. In Bellaire, Portsmouth and Steubenville, where purification began in 1915, the drops have been, respectively, 37 to 13, 86 to 33 and 70 to 33. The fact that the rates in several of these cities, despite the heavy decreases noted, still remain high by comparison with Cincinnati indicates, according to the health department, that water purification does not "tell the whole story" in typhoid prevention. Wells and insanitary privies are designated as causing much typhoid fever, even though the city water supply is pure. Toledo is cited as a city in which other causes have prevented water purification from making much change in the death rate. The typhoid death rate for the state at large has declined steadily in recent years, falling from 27 in 1910 to 15 in 1916.

WATER SUPPLY

State Health Department Has Emergency Chlorinator.

Columbus, O.—The division of sanitary engineering of the state department of health now possesses an emergency apparatus for the chlorination of water, which will be available for use by any city of the state when need suddenly arises for temporary disinfection of water. The chlorinator was used for several weeks recently in Hamilton, where the calling into use of an emergency water supply made disinfection necessary. The Hamilton city authorities in this case supplied the materials.

Water Companies Lose in Diversion Suits.

Paterson, N. J.—Finding that the answer of East Jersey, Montclair and Acquackanonk Water companies, as a whole, does not constitute a valid defense to the suit brought by the Weidmann Silk Dyeing Company of Paterson to enjoin the further diversion of water from the Passaic River or its tributaries, Chancellor Walker has filed an opinion striking out the answer. Chancellor Walker held that, since the Weidmann company is entitled to an injunction upon equitable terms, these terms may be settled upon motion instead of requiring the complaining company to go to a final hearing. The opinion pointed out that as shown by the petition of the Weidmann company the only issue in the case would follow refusal of the defendant corporations to make compensation for the diversion. As the answer of the defendants contained an offer to make compensation, if the rights of the Weidmann company should be established, the court held that this having been done it has power by virtue of the consent to fix the compensation. Discussing further the equities of the case, Chancellor Walker said:

> "If an upper riparian owner diverts water from a lower one for the purpose of supplying water companies or municipalities which have the ultimate power of condemning the water rights in question, they would be allowed to do so upon compensation being made in aid of the upper owner's diversion for public use, exercising their own rights of condemnation in connection with contracts with the diverting riparian owner.
>
> "There is no estoppel against a lower riparian owner's protection of its right, as such, by mere silence or failure to give notice, or bring suit. This legal right of the riparian owner is barred only by a grant or by uninterrupted enjoyment by an upper owner for the full prescribed period of twenty years.
>
> "A lower riparian owner who with others pollutes a stream from which an upper riparian owner diverts the water, is not thereby estopped from having appropriate injunctive relief upon the principle that it does not come into court with clean hands because the maxim is confined to this conduct, however gross, with which the opposite party has no concern."

STREET LIGHTING AND POWER

Electric Rates Increased.

Philadelphia, Pa.—The rates of the Philadelphia Electric Company for manufacturing purposes and lighting of business places are to be increased 10 per cent under the terms of an order by the public service commission. The company asked for a 20 per cent increase, which, however, would not affect residential lighting rates or the contracts the city has for the illumination of the park system and streets. William Draper Lewis, who opposed the application of the company, said war conditions made an increase in rates necessary; but he argued the increase should be kept down to 7 per cent. Similar orders were issued to the Bala and Merion Electric Company and the Delaware County Electric Company, which also had asked for 20 per cent increases. The commission said:

> "Under the provisions of the public service commission, rates which have been determined by the commission cannot be changed by the company within a period of three years after the action of the commission unless application is made to the commission for permission to make such change.
>
> "From the testimony it appeared that the operating expenses of the companies had been increased to an unusual extent by the abnormal prices they were required to pay for labor, materials and coal, and that the great industrial development in Philadelphia and surrounding territory has forced the companies to expend large sums of money in an endeavor to meet the requirements of the district for electric power.
>
> "The companies asked the commission to permit them to increase by 20 per cent their charges to all classes of consumers except domestic consumers, who admitted that the company was entitled to an increase in its rates for power, but contended that the amount asked for was excessive. After considering the testimony the commission made an order refusing to grant its approval to the 20 per cent increase, but authorizing the companies to file new tariffs effective on one day's notice increasing by 10 per cent their charges to all except the small consumers and the municipalities, whose rates are to remain as heretofore.
>
> "The commission refused to make this increased schedule effective during the duration of the war, and stipulated that it should become void at the end of a year, unless the companies furnished the commission with detailed statements of the result of their operations and secured a further authorization from the commission."

President Wilson and Secretary McAdoo on Public Utilities.

Washington, D. C.—Secretary of the Treasury William G. McAdoo has made public a letter to President Wilson regarding the condition of the public utilities of the country. He says:

> "I beg to hand you herewith several memoranda and letters relating to street railway and other local public utilities furnishing light, heat, and power, which I have been asked to bring to your attention by a committee representing public utility interests.
>
> "These papers indicate the existence of genuine apprehension regarding the adequacy under present conditions of the services and rates of local public utilities. The view is expressed that increased wages and the high cost of essential materials and supplies have affected them as they have affected everybody else, and that united effort will be necessary in order to meet alike the public requirements for service and the corporate financial needs upon which that service depends.
>
> "As Secretary of the Treasury I must take official notice of these matters. It is obvious that every part of our industrial and economic life should be maintained at its maximum strength in order that each may contribute in the fullest measure to the vigorous prosecution of the war. Our local public utilities must not be permitted to become weakened. The transportation of workers to and from our vital industries and the health and comfort of our citizens in their homes are dependent upon them, and the necessary power to drive many of our war industries and many other industries essential to the war is produced by them. It may be that here and there, because of the prominence given to less important interests immediately at hand, State and local authorities do not always appreciate the close connection between the soundness and efficiency of these local utilities and the national strength and vigor, and do not resort with sufficient promptness to the call for remedial measures. In such cases I am confident that all such State and local authorities will respond promptly to the national needs when the matter is fairly and properly brought before them.
>
> "Our public service utilities are closely connected with and are an essential part of our preparations for and successful prosecution of the war, and the unfavorable tendencies which the accompanying papers reveal may most effectively be checked, wherever they may be found to exist, and the needed relief obtained, only by prompt action on the part of the respective local authorities.
>
> "I earnestly hope that you may feel justified in expressing the conviction that the vital part which the public utilities companies represent in the life and war-making energy of the Nation ought to receive fair and just recognition by State and local authorities."

President Wilson's reply was as follows:

> "I have examined with care the memoranda and letter which you transmitted to me with your letter. I fully share the view you express regarding the importance of the public service utilities as a part of our national equipment, especially in war time. It is essential that these utilities should be maintained at their maximum efficiency and that everything reasonably possible should be done with that end in view. I hope that State and local authorities, where they have not already done so, will, when the facts are properly laid before them, respond promptly to the necessities of the situation.
>
> "I shall be glad to have you communicate with the local authorities whenever the information in your possession suggests that such a course is desirable and in the national interest."

Commission Rules on Conservation in Utility Financing.

San Francisco, Cal.—Establishing the policy that public utilities should postpone all extension work not clearly necessary while "the costs of materials and money are abnormally high," the state railroad commission has permitted the Pacific Gas and Electric Company to use $771,348 from bond sales to pay for capital expenditures in the recent past, but considers the proposed bond issue of $3,000,000 for development and expansion unwise on account of the money market. It was to reimburse its treasury for expenditures up to August 31, last, and to finance in part the large improvements referred to, that the company asked the commission for authority for the $3,000,000 issue at not less than 85 per cent of face value. This $3,000,000 issue, being now considered unwise on account of the money market, the company itself so stating, the decision says that it is not necessary to approve the company's construction programme in all its details, but that the new gas works at Fresno seem advisable, as also the enlargement of the Potrero gas plant, and the utilization of existing interconnection facilities between the Northern California hydro-electric utilities, by hooking up the Wise tower line with the line of the Sierra and San Francisco Power Company at Manteca, and thence using the Sierra's line from Manteca to Mission San Jose. Referring to the influence of war conditions on the proposed financing of the Pacific Gas and Electric Company, the decision of the Railroad Commission says:

> "It is a matter of common knowledge that many public utilities as well as other enterprises will have considerable difficulty in financing new construction during the war. The general welfare requires that our electric utilities, which play so vital a part in the Nation's efficiency, shall, in so far as possible, conserve their financial strength so that they may continue to be able to secure such funds as are imperatively needed to increase their production and maintain their efficiency. Expenditures which otherwise might be considered desirable, even though not immediately necessary, should be deferred in favor of expenditures most urgently necessary at the moment to increase the efficiency of these utilities to help win the war."

Expert Reports on Street Lighting Contract.

Newark, N. J.—The Public Lighting Service Corporation, which furnishes and maintains gas lamps for street lighting, is not living up to the terms of its contract, according to a report submitted to director Raymond of streets and public improvements by Willard D. Hine, a gas engineer of New York, retained to make an investigation. It is not unlikely that Mr. Raymond will endeavor to terminate the contract. The company's bills for the last few months have been referred to the law department to furnish a basis of settlement. Laboratory tests of the lamps made by Mr. Hine, the report states, showed that they did not give fifty candle-power when burning 3.3 cubic feet of gas an hour. Conditions in the laboratory were more favorable to the lamps than they would be on the street, so that Mr. Hine concluded the candle-power of lamps on the street would be considerably lower. The contract provides that lamps of fifty candle-power must be furnished. Other respects in which Mr. Hine says the lamp company has fallen down are: "Many lamps are not marked with the street number; many lamps are not lighted, although the gas was available; the lamps and fixtures are not maintained in a workmanlike and substantial manner." Of sixty-nine gas lamps he inspected January 4 he found fifteen were out; fifteen gave poor light; seven gave fair light; twenty-nine gave good light, and three very good light. The recommendations made in the report are:

> "The entire co-operation of the Police Department should be secured in connection with the daily reporting of all gas lamp outages.
>
> "All outages observed should be officially reported the same day both to the Public Lighting Service Corporation and to the Public Service Gas Company.
>
> "The Public Lighting Service Corporation should report to the City Lighting Department daily all outages because of no gas and this report should be forwarded immediately to the gas company.
>
> "The gas company should be required to take immediate steps to open all services and risers where reported to them as without gas.
>
> "The Public Lighting Service Corporation should be required to comply fully with all the terms of its contract with the city."

FIRE AND POLICE

New Rates of Pay for Firemen and Police.

Ogden, Utah.—Over the protest of the mayor, who urged that the fire chief and police chief be given equal salaries, the council passed an ordinance fixing the rates of pay in the two departments. These will be: Fire department: Chief, $165; assistant chief, $125; captain, $115; machinist, $110; inspector, $100. Each fireman other than those enumerated will receive $85 per month the first year, $95 the second year and $105 per month thereafter. Police department: Chief, $175; captain of detectives, $120; sergeant, $110; detectives, $100; eleven patrolmen, first year, $90; second year, $100; desk sergeant and property clerk, $95; two desk sergeants, $85; chauffeurs, first year, $90; second year, $100; guard, janitor and weight master, $70; merchants' patrol, $35.

Dubuque, Ia.—Following a request of the firemen for a twenty per cent. raise in wages, council voted to give the firemen a flat raise of ten dollars per month clear through the department and to make the wages of the policemen the same as the firemen. The wages of police and fire departments will now be as follows: Chief—$135 per month. (Formerly $130 for police and $125 for fire.) Captains (also detectives in the police force)—$95.00 per month. (Formerly $85.00.) Engineers in fire department—$97.50 per month. (Formerly $87.50.) Desk sergeant (in police department)—$100 per month. (Formerly $100.00.) First year men (both departments)—$75.00 per month. (Formerly $65.00 for fire and $70.00 for police.) Second year men (both departments)—$80.00 per month. (Formerly $70.00 for fire, $75.00 for police.) Third year men (both departments)—$85.00 per month. (Formerly $75.00 for fire, $75.00 for police. After three years (both departments)—$90.00 per month. (Formerly $80.00 for fire, $75.00 for police.) City electrician—$110.00 per month. (Formerly $100.00.)

Police Chief Loses in Suit Over Discharge.

San Antonio, Tex.—The verdict returned in favor of Frank Newnam, former chief of police, together with a judgment of $1,927.86 against the city, growing out of his discharge upon the election of the late mayor Jones, has been reversed and remanded by the court of civil appeals. This case was brought in the Forty-fifth district court and judgment submitted there on special issues. One of these set forth that Newnam was discharged by mayor Jones for political reasons and that this was contrary to the expressed provision in the charter. In the opinion the charter provision is quoted. This gives the power to the mayor to discharge an employe whom he feels is "incompetent or unfit," but stipulates such employe must not be discharged for political reasons. It is pointed out by justice Swearingen that there is nothing to show that mayor Jones did not feel that Mr. Newnam was "incompetent and unfit" to be at the head of the police department and the fact that the first plank in mayor Jones' platform was that he would "fire Frank Newnam" did not alter the situation. The court held that the belief that Newnam was unfitted for this office may have actuated mayor Jones to have placed this in his platform. The fact that W. L. Richter, John Kinney and P. G. Lucas, aldermen at the time, testified that they believed Mr. Newnam competent and fit, the court holds, does not prove that he was so considered by mayor Jones and that is the one point at issue. The political reason, the court holds, may have been founded on the opinion and, if so, the mayor would not have been barred from discharging the officer. The discharge of former chief of police Newnam followed the bitter political fight of 1912, when Jones was elected to fill out the unexpired term due to the death of mayor Callaghan. The first act of mayor Jones, when he took office was to announce the discharge of Newnam. The suit subsequently brought by Newnam was for salary, which he claimed was due him as chief of police from August 19, 1912, until June 1, 1913.

Big Loss in Chocolate Factory Fire.

Hershey, Pa.—Fire which broke out on the top floor of one of the buildings of the Hershey Chocolate Company's plant caused a loss estimated at several hundred thousand dollars. The room in which the blaze occurred is about 200 feet long by 60 feet deep and more than 1,000,000 pounds of chocolate in powdered form, one of the advanced stages of manufacture, was stored there. The building was of fireproof construction, and while the blaze was confined to the fourth floor, where it originated, stock in other rooms was damaged by water. Local companies fought the blaze, sending out calls for aid to neighboring towns. The fire was under control when Lebanon companies responded and helped to extinguish it. A watchman saw no evidence of fire when he made his rounds shortly before the flames were discovered. While no definite cause of the blaze has been found, it is thought to have been the result of spontaneous combustion.

GOVERNMENT AND FINANCE

Barlow Succeeds Waite as Dayton Manager.

Dayton, O.—Service director J. E. Barlow has been named city manager to succeed Henry M. Waite, who is on leave of absence in army service. Manager Barlow will receive $7,500 a year instead of the $12,000 Mr. Waite received because "the job grows easier." "City manager Waite came to this city just after the flood of 1913," said commissioner Flotron. "Our finances and physical property were then in a chaotic condition. Extra effort was required then to work out and establish the policies and an organization for the new government. Today the form of government is a going concern." The appointment conforms with the recommendation of Mr. Waite and with the theory of promotion by which the post of director of public service was considered next to that of the manager. Mr. Barlow was born in Summerville, Mass., about forty-five years ago. He took a college preparatory course at Phillips Academy, Andover, Mass. He then entered the Boston Institute of Technology, where he obtained his B. S. degree. He then became instructor in the college from which he matriculated. A little later he was engaged in United States geological survey work and still later had an important post on the construction of the Charles river dam. Then Barlow was taken over by the Metropolitan water and sewerage board of Boston and afterwards by the board of water supply of New York on the Catskill project. While in New York, Mr. Barlow was an instructor in the Brooklyn Polytechnic institute. He then went to Cincinnati as an expert engineer with the bureau of municipal research and subsequently was made principal assistant to the chief engineer of the city by Henry M. Waite. When Waite was called here as city manager, he brought Barlow with him. Another man whom Waite brought with him was Harry P. Martin, who has been employed here as street commissioner. He had been employed in the same capacity in Cincinnati. Martin, it is believed, will be appointed by city manager Barlow as his own successor in the position of service director. To this position there attaches an annual salary of $4,000. Among the reasons given by commissioner Flotpon for the appointment of Mr. Barlow were: "In the state of Ohio or any other place, for that matter, there is no man available for city manager who has a more comprehensive grasp of this situation than Mr. Barlow. He is, himself, an engineer, of far more than ordinary ability and can work into the breach with splendid effect (referring to the conservancy project). We have in course of construction many sewers, extension of water mains, bridges, etc., with which Mr. Barlow, alone, is familiar and consequently the most logical man to be placed in charge to carry out this program. Mr. Barlow, I have found, has always been conservative and safe on every problem. He has never been antagonistic to labor or unfairly friendly to capital. The taxpayers of Dayton have paid for his education so far as the application of his ability to our needs are concerned, and it would be a foolish policy to destroy that investment and take a chance of bringing some new, untried, inexperienced man who might in the end prove a failure, and this is no time for experiment."

City manager Waite, who has a month's leave of absence, is now lieutenant-colonel of the transportation corps, engineering department. If at the end of the month he is still in the army he will resign his $12,500 position to continue in the new one, which pays $3,500. Many months ago Mr. Waite offered his services to the government in any capacity.

City Entitled to Franchise Guarantee.

Portsmouth, Va.—"We are of the opinion that the city of Portsmouth is entitled to the fund in controversy in any aspect of the case," ruled the Virginia Supreme Court of Appeals in an opinion reversing the Portsmouth court in the case in which the Portsmouth and Norfolk Corporation endeavored to recover the amount of a $5,000 certified check which it put up in 1910 as a guarantee of its good faith when it bid for the franchise for lighting the streets of the city. Although awarded the contract, the company, because unable to finance the undertaking, declined to execute it and the $5,000 was forfeited. Five years later it sought to get back the money, contending that the requirement of a deposit as a prerequisite to bidding for a public franchise is contrary to the constitution of Virginia. "This proposition," said the appellate tribunal, "is based upon a misapprehension of facts."

Charges Against East St. Louis Mayor Dismissed.

East St. Louis, Ill.—The indictment against mayor Mollman of East St. Louis, arising out of the race riots there last July, has been dismissed in the circuit court.

Urges Just Equalizations.

Albany, N. Y.—In a letter to the mayors of the state, the tax committee of the New York State Conference of Mayors and Other City Officials urges each city to make an investigation of the equalization of assessments and apportionment of general taxes by board of supervisors or the equalization commission of its county. If it be determined after examination that serious injustice has been done by such equalization and apportionment, the city is urged to appeal to the state tax commission for relief. "Examination of equalization by boards of supervisors, generally, leads to no other conclusion," the letter says, "than that by far the greater number of equalizations are not based upon facts—rather upon favoritism and politics." To prove this the committee cites the experiences of four cities. Saratoga Springs appealed to the state tax commission from the equalization of assessments by the supervisors of Saratoga county and as a result had refunded to it about $30,000. North Tonawanda and Lockport have recovered $10,000 each in a similar way. Buffalo has received about $80,000 from the other tax districts in the county on account of taxes incorrectly apportioned by the board of supervisors. Appeals from county equalizations now pending before the state tax commission are from Lackawanna, Saratoga, Schenectady, Troy and New Rochelle.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Municipal Electric Plant—Liability of City.

(Okla.) City operating electric plant for sale of electricity, etc., was subject to same liability to its employees as that assumed by private persons or corporations, and was bound to exercise correspondingly high degree of care, with regard to probable contingencies.—City of Durant v. Allen, 168 P. 205.

Worthless Pavement—Assessment—Recovery.

(Wis.) Where worthlessness of street pavement was due to city's negligence held that property owners, assessed for the original pavement and for its resurfacing, had a right of action for the damages caused by the second assessment. —Crowley v. City of Milwaukee, 164 N. W. 833.

Planking on Street—Sound Practice—Liability.

(N. Y. Sup.) Where street being excavated is planked by contractor for city of New York, under approval and direction of Public Service Commission and in accordance with sound engineering practice, one injured by breaking through must show actual or constructive notice of defect in plank.—Schmidt v. City of New York, 167 N. Y. 23.

Parks—Not Governmental Function.

(Idaho) The care and maintenance of parks is primarily a private, as opposed to a governmental, function.—Boise Development Co. v. Boise City, 167 P. 1032.

Police Power—Abating Nuisances.

(Iowa) The power conferred by Code Supp. 1913, §696, authorizing municipal corporations to abate nuisances, can be exercised only in accordance with ordinance regularly and legally adopted.—Wilson v. City of Ottumwa, 164 N. W. 613.

Police Power—Sunday "Movies."

(Tex. Cr. App.) Ordinance allowing a moving picture show to remain open on Sunday cannot suspend Pen. Code 1911, art. 302, prohibiting them to run on Sunday with certain films.—Zucarro v. State, 197 S. W. 982.

Survey Line—Location of Property.

(Ill.) If line of section as run by government surveyor is not coincident with line run by surveyors employed by owners of property to lay out plats, right of owners is not lessened to locate street and line of survey, so far as they own property, at point where it is located in surveyors' plats.—Wolpert v. City of Chicago, 117 N. E. 447.

Police Power—Requiring Monthly Statements.

(Ky.) Ordinance requiring monthly statements of business from money lenders held invalid, and not within police powers.—Salisbury v. Equitable Purchasing Co., 197 S. W. 813.

Exemption for Sewer Assessments—Grounds.

(Ohio) Owner of abutting lot, claiming its exemption from sewer construction assessment on ground that it is provided with a local drainage, has burden of showing that such drainage is adequate for surface drainage and the usual purpose of sewerage.—City of Cincinnati v. Polster, 117 N. E. 155.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

March 13.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington. Secretary-treasurer, Geo. A. Reed, Montpelier, Vt.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

New England Water Works Association.

The standard specifications for cast-iron pipe of the American Water Works Association were considered at the Feb. 13 meeting of the New England Water Works Association in Boston. In accord with the recommendation of the national society's committee and the New England committee, copies of the specifications had been printed and distributed to all members.

A questionnaire is to be sent out asking whether the members approve the details in the specifications in the matter of (1) adoption of uniform outside diameter; (2) chemical requirements of the metal, and (3) relation between flexure and breaking load. It is understood that no change will be made in the standard specifications for pipe and specials until after the war and, after that, a resonable period to allow the manufacturers to change their equipment.

Chairman F. A. Innes, of the committee, urged that the manufacturers give definite information of the cost of making changes in patterns and molds to produce the uniform outside diameter for all classes of pipe of a given nominal size. All speakers, except the representatives of the manufacturers, approved uniformity in outside diameter. The standard specifications recently adopted by the British Institution of Water Works Engineers call for the uniform external diameter, and this was frequently pointed out.

Charles R. Wood, who represented the manufacturers, said that they would comply with the new specifications when they were convinced of a real demand by consumers, but that at present pipe users were satisfied with existing specifications and that a change would be a waste of money and energy. He also asked that the manufacturers be allowed to submit suggestions for additional questions in the questionnaire.

J. M. Diven, secretary of the national association, urged that the questionnaire be sent to the membership of both associations, suggesting that even if the new requirements were not adopted, there should be a revision and reconciliation of the two sets of specifications, to obtain a single standard.

Alfred O. Doane, division engineer of the Metropolitan water works, Boston, read a short paper on pumping engines, development and comparative characteristics.

Dominion Association of Fire Chiefs.

The president of the Dominion Association of Fire Chiefs will shortly call a meeting of the board of directors to arrange for holding the tenth annual convention in the city of Toronto, Ont. Suggestions as to topics for discussion, or any other business, as well as to the date of convention, will be welcomed by the board. All communications in this respect are to reach the secretary not later than March 15. It has already been suggested that the convention be held during the first week of the Toronto Exhibition.

That the work and influence of the association may be extended, it is considered desirable that a complete list of the names of all fire chiefs in Canada shall be on file in the office of the secretary. All are asked to help in having this done by sending in the name of every chief who is not at present a member of the association.

Southwestern Society of Engineers.

A "traveling meeting" will be the form taken by the annual convention of the Southwestern Society of Engineers, held April 18, 19 and 20. The delegates will meet for one day in each of three cities of Douglas, Bisbee and Tucson, travelling at night and convening in the day time.

The directors of the association, who recently met in El Paso, Tex., chose the following officers: President, G. M. Butler, Tucson, Ariz.; first vice-president, S. H. Worrell, El Paso; second vice-president, Gerald Sherman, Bisbee, Ariz.; treasurer, R. W. Goddard, State College, N. M.; secretary, C. E. Barglebaugh, El Paso.

Engineers' Club of Kansas City.

The sixth annual dinner of the Engineers' Club of Kansas City, Mo., held Jan. 29, was attended by over two hundred members. Officers elected for the coming year were: President, Alfred Hurlburt; first vice-president, F. B. Scheetz; second vice-president, A. C. Everham; secretary, Robert S. Beard; executive committee, H. B. Treadway, Ralph R. Benedict and William Bugg.

PROBLEMS CITIES ARE STUDYING

WITH EXPERTS

Worth county drainage district, Grant City, Mo., is to engaged in extensive FLOOD PREVENTION improvements. Plans for the work are in the hands of the Clarke E. Jacoby Engineering Co.

PAVING IMPROVEMENTS are to be made by La Grange, Ill., plans for the work having been completed by E. L. Hancock.

Barberton, O., is to build a SANITARY SEWER SYSTEM to cost about $85,000. The city's consulting engineer for the project is R. Winthrop Pratt.

A FILTRATION PLANT is to be built by Evans City, Pa. Plans are in course of preparation by the engineer, P. H. Martin.

Jeffersonville, Ga., proposes to issue bonds for the construction of ELECTRIC LIGHT and WATER SYSTEMS. The engineer for the work is W. H. Goodlow.

A bond issue is soon to be voted on for the construction of WATERWORKS for Gaylord, Kan. Preliminary plans for the improvement have been prepared by the engineer, G. P. Taylor.

Twin Falls, Ida., is to improve its WATER SYSTEM at a cost of $375,000. Plans for the improvement are being prepared by the engineering firm of Burns & McDonnell.

SEWER EXTENSIONS are to be built by Woodbury, N. J. The engineer for the work is Wm. H. Boardman.

A SEWER SYSTEM is to be built by Wilton, N. D., plans and specifications having been completed by the engineer, T. R. Atkinson.

THE WATERWORKS SYSTEM of Rush City, Minn., is to be improved. The engineer for the work is Frederick Bass.

STREET IMPROVEMENTS are to be made by Moorestown, N. J. The engineering firm of Haines & Sherman, will have charge of the plans for the work.

The city commissioners have been investigating the manner in which the Public Service Corporation has been fulfilling its STREET LIGHTING CONTRACT. The city's consulting gas engineer, Willard D. Hine, has completed a report on the conditions.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is a tendency to cut about $2 a ton on 6-inch and $1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

Army Engineers Want Catalogs.—John J. Huber, Acting Adjutant, 2nd Battalion, special highway regiment, 23rd Engineers, Laurel, Md., wants a file of catalogs of road, quarry and bridge machinery and equipment. Five copies of all catalogs are requested.

Construction Materials Situation.

Navy demands as shown by actual New York orders placed in the last two weeks give evidence that other building materials are going to have a market here this year far greater than that heretofore conceived. Rear Admiral Haliday came from Washington when a complaint from a large company reached the Navy Department that the market was held so high that it was unable to avoid delays in important construction work. A conference of crushed stone and gravel men was called, and the proposition was made for gravel to be mined and shipped at a certain upset price below the current wholesale list. The gravel men protested that such a proceeding would be confiscatory. It was announced that the Navy Department would be first in the market for 600,000,000 yards of three-quarter inch gravel, and that after its needs were supplied a great deal more would be needed by the army and other departments.

The price was not divulged for publication, but it was below the prices named for private needs. Companies were cautioned not to contract to private consumers unless Government requirements were provided for. At the same conference the navy officials questioned the crushed stone interests and stated that 1,000,000 yards of crushed stone would be required, but in this department that would leave a like amount available for private needs, because the quarries in this vicinity can turn out about 2,500,000 yards a season. Approximately 500,000 yards have already been contracted. Prices for crushed stone and gravel have both gone up. Current quotations now rule for three-quarter-inch gravel at from $1.80 to $1.90 a yard, wholesale, New York, to private operations, and on crushed trap rock and blue stone about the same levels prevail. One year ago at this time the price for gravel was $1 a yard, and blue stone $1.10. Trap rock was at that time $1.15.

Simultaneous with this shift in the concrete ingredient market a large part of the membership of the Executive Committee of the Portland Cement Association met at the Biltmore, in New York city, with B. F. Afleck, the president. There are only a few of the Portland cement plants in the Lehigh district that are operating now, the major part of them being closed down because of lack of coal at a time when concrete and cement demand is at its height with hardly any reserves on hand not now contracted for. The surplus on hand early in January has practically entirely disappeared.

The records of the bridge builders and Structural Society as collected by George E. Gifford, secretary, show that during the month of January 53 per cent of the bridge and structural shops of the country was contracted for.

In the asphaltum market there is still a great deal of difficulty in obtaining supplies.

The lime and plaster departments production is hampered by lack of labor and fuel.

National Lime Manufacturers' Association.—The annual convention of the assocation has been postponed until April 3 and 4. It was to have been held in the beginning of this month in Chicago.

Highway Industries Association.

The Highway Industries Association, which was organized recently in Chicago, was completely organized at a meeting of the officers and board of directors held in Washington Feb. 15. The member organizations have approved the nomination of their representatives on the board of directors.

The officers of the association are now as follows: Executive Committee (all directors), A. P. Sandles, National Crushed Stone Manufacturers' Assn.; E. J. Rutherford, general sales manager, Goodrich Tire Co., Motor Car and Accessories Manufacturers' Assn.; A. N. Johnston, Portland Cement Association; W. P. Blair, National Paving Manufacturers' Association; Winser T. White, motor truck branch, National Automobile Chamber of Commerce. The following officers are also directors and ex-officio members of the executive committee: President, S. M. Williams, general sales manager, Garford Motor Truck Co.; vice-president, A. R. Hirst, state highway engineer of Wisconsin; vice-president, E. J. Mehren, editor of Engineering News-Record, succeeding Lion Gardiner, resigned; vice-president, S. T. Henry, vice-president, Allied Construction Machinery Corporation.

The other directors of the association are: H. J. Love, National Stone Association; E. G. Sutton, National Association of Sand and Gravel Producers; S. J. Morrison, National Association of Asphalt Block Manufacturers; S. T. Beatty, National Association of Road Machinery Manufacturers; W. E. Metzgar, motor car branch of the National Automobile Chamber of Commerce.

Offices are being established in Washington and a program, following suggestions by the American Association of State Highway Officials and government bodies, is being developed. It is estimated that the industries so far represented in the association have a total capitalization amounting to more than $2,000,000,000. The companies employ over 1,000,000 persons.

PERSONALS

The following are new officials:

New Haven, Conn.—Permanent paving board, Charles M. Costello; health department, Dr. William T. Butler; police commission, P. George Nicolari and Daniel J. Hurley; fire commission, Thomas C. Bracken, Lawrence E. Reif and Col. George D. Post; public parks, John H. Shaw, Harry W. Hitchcock and Henry Griswold.

Titusville, Pa.—Mayor, Charles B. Morgan; supt. finance and accounts, T. U. Smith; supt. parks and public property, L. O. Bradley; supt. streets and public improvements, John G. Marron; supt. public safety, John Blinzig; city clerk, W. M. Dame; city engineer, Karl R. Kightlinger; fire chief, Allie Longtine; police chief, Herbert S. Edwards

Oil City, Pa.—Mayor, William Agnew; city clerk, William W. Holt; city engineer, B. B. Weber; commission council, A. W. Kinney, A. B. Burns, H. G. McKnight, D. K. Johnson; street commissioner, A. J. Short; chief of police, Edward Nugent; fire chief, Albert G. Dolby; health officer, E. M. Voorheis.

Biloxi, Miss.—Supt. waterworks, Joseph Tucci; health department, Dr. W. T. Bolton; sanitary inspector, Robert Michel.

Vincennes, Ind.—Mayor, Dr. James D. McDowell; city clerk, C. L. V. Tucker; chief of police, H. F. Jones; city engineer, J. S. Spiker; board of public works, George W. Donaldson; fire chief, Jerry Hedden.

Utica, N. Y.—City engineer, Joseph Kemper; commissioner of public safety, Joseph Hamlin; commissioner of public works, Harry R. Hayes.

Rahway, N. J.—Mayor, David H. Trembly; commissioners, David Armstrong and James B. Furber.

Pottsville, Pa.—Mayor, F. P. Mortimer; director public safety, J. O. Bearstler; director public property, Geo. J. Smith; city clerk, G. A. Berner; fire chief, W. L. Stevenson; director streets and public improvements, Joseph H. Nichter; director finance and accounts, George W. Jungkirth; city engineer, W. S. Pugh; road foreman, James A. Lynaugh.

Auburn, N. Y.—City engineer, Thomas B. Bergan; police commissioner, George F. Sweet; commissioner of public works, Dr. Louis E. Jenkins; fire commissioner, Dennis J. Sweeney; park commissioner, Frank H. Armstrong; commissioner of health, Albert H. Nichols.

Municipal Journal

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MAINTAINING RESERVOIRS IN TROPICAL COUNTRIES

How Reservoirs of the Canal Zone Water Supply Are Protected from Pollution by Trees and Undergrowth, Grass, Aquatic Plants, and Microscopic Organisms—Stagnation and Putrefaction in Reservoirs.

The plants used for purifying the water supplied to the United States settlements in the Canal Zone were described in Municipal Journal for April 19, 1917, together with a number of interesting features connected with their operation. As stated then, most of these were due to conditions peculiar to a tropical climate, but which to less degree might be found in the southern part of the United States. The 1917 report of Geo. C. Bunker, Physiologist to the Panama Canal, shows that many of the same experiences were repeated last year, but remedies had been applied successfully to others. Some of the more interesting portions of the report will be found abstracted in the following article, and in one or more to be published later.

There are many valuable data contained in the report, being those collected during the year relative to the effect upon the water of vegetation, plankton, algae, heat and other conditions; the presence and significance of various bacteria; the results of variations in treatment by sedimentation, aeration, chemicals and disinfectants; the effect of filtered water on metal pipes of various kinds. Unfortunately this report exists in typewritten form only, no provision having been made for printing it, and the material is so voluminous that it is impossible to give more than a few brief synopses in a periodical like Municipal Journal.

There are four reservoirs in use in connection with the water supply of the Canal Zone—Agua Clara, 69.5 acres water area, 612 million gallons; Brazos Brook, 156.0 acres water area, 650 million gallons; Rio Grande, 62.0 acres water area, 400 million gallons; and Camacho, 38.4 acres water area, 283.5 million gallons.

The watersheds of the four reservoirs in use by the Panama Canal are free from pollution of human origin. They are, however, subject to pollution from the large numbers of wild animals in the jungle growth.

The rapid cycles of life and vegetation in the tropics produce a large amount of material from which organic matter is extracted. The principal sources of the latter are: Trees and undergrowth; grass; aquatic plants, and miscroscopic organism.

Trees and Undergrowth.—The feeders of the reservoir run through the jungle, which is so dense that one has to walk in the bed of the stream with a machette man in advance, in order to reach their sources. The trees, bushes, creepers and vines are thickly entangled along the banks and overhead. Under these conditions large numbers of leaves fall, especially during the dry seasons, upon the beds of the streams, on their banks, and into pools of stagnant water. A few of the feeders on some of the watersheds maintain a constant though small flow, but the majority dry up soon after the wet season closes. In case there is sufficient rainfall to overbalance the

CUTTING GRASS AROUND THE SHORE OF RIO GRANDE RESERVOIR.

evaporation, the water in some of the pools remains during the entire dry season, and extracts a large amount of coloring matter from the leaves which have collected. The contents of these pools, together with the leaves on the dry portions of the beds of the streams, may be flushed into the reservoir by the first heavy rains of the wet season and occasionally by unusually heavy rains during the dry season. The majority of the leaves and twigs sink to the bottom of the reservoir at the mouths of the feeders, furnishing material for putrefactive action, which may readily be observed by pushing an oar or stick into the soft mass with a resultant liberation of the gases which accumulate during the putrefaction of the organic matter. During the dry season the elevation of the reservoir may fall sufficiently to bring this highly colored stagnant water into circulation, with the result that soluble and colloidal decomposable material is carried out into the main body of the reservoir. In addition, a large amount of organic matter is washed directly into the main body of the reservoir by the rains falling on those sections or areas of the watersheds which slope toward the shore line and which are covered with leaves and rotting vegetation.

The torrential rains which frequently occur in the rainy seasons over relatively small areas of the watersheds bring down boulders of considerable size, large amounts of gravel, soft rocks, soil, dead vegetation, broken branches of trees and decaying logs, with the result that miniature deltas have been formed in the last few years at the mouths of many of the feeders.

The floors of the watersheds are covered with thick carpets of fallen leaves and other materials from the trees and miscellaneous vegetation, some of which is carried in suspension or solution by the run off.

Grass.—Luxuriant growths of various grasses and weeds contribute as much, if not more organic matter than do leaves. Para grass in particular, which grows very abundantly along the shore line of Rio Grande reservoir and on low flat areas of the catchment basin and is alternately exposed and covered by fluctuations in water levels, adds a large amount of coloring matter to the water. With a shore line 20,000 feet long, it is impossible to cut all of the grass which will be flooded by a quick rise in the water level at the start of the rainy season, unless a large gang of men is employed with a resulting excessive cost of maintenance. Before the entire shore line is cut and the grass disposed of by a gang of twelve men, the water level in the dry season has dropped and additional areas been exposed for growth of grass, so that not only is the number of square feet of grass cutting area increased, but the grass first cut will be high enough to call for a second cutting. Flooded grass rapidly turns brown and increases the color of the water materially, in addition to furnishing organic matter for the putrefactive reactions in the bottom layers of the water.

Para grass will grow in the water as well as on land, and it is not uncommon to pull out stalks 10 to 12 feet long, with joints 12 to 18 inches apart, which, if thrown on the ground, will sprout from each joint, the sprouts growing at the rate of 6 to 7 inches in 21 days. It grows so thick that it requires two men to push an ordinary row boat through it by poling. During the rainy season it grows at the rate of 13 inches in 21 days on the shore line of Rio Grande reservoir. Large numbers of birds live in it, and add their quota of members of the Colon group to the surrounding water.

Microscopic organisms, classed as littoral, attach themselves to grass growing in shallow water or along the shore line, from which they are washed off by wave action and scattered throughout the water. Large numbers of the genus Rivularia, in the typical brown colored hemispherical or bladdery forms, are attached to the submerge stalks of the grass.

There is a difference in regard to the growth of grass on the shore lines of the four reservoirs. Around Agua Clara reservoir, with a large percentage of its shore line made up of red clay banks, the growth of grass is relatively slight. In fact, a more vigorous growth would be desirable to prevent erosion of the banks and resulting addition of iron to the water. At Brazos Brook reservoir, where the water is maintained at a relatively constant level, the removal of grass from the shore line is not difficult. At Rio Grande reservoir there is an abnormal growth of grass and its removal is very expensive.

Aquatic Plants.—In Brazos Brook reservoir there is a luxuriant growth of a pond weed known as "Najas marina" which grows mostly in shallow water. In what is known as the upper reservoir it grows very abundantly and removes considerable of the suspended matter from the inflowing weight, but later on sinks from the accumulated weight and materially increases the amount of organic matter on the bottom of the reservoir. Three other varieties of water weeds have made their appearance in this body of water. These aquatic plants have appeared in the last two years, and promise to become a serious proposition, as their removal is expensive. In the other three reservoirs they are present in limited numbers in the shallow water areas.

Microscopic Organisms (Plankton).—Although of minute size, the plankton forms furnish, on account of their rapid reproduction and short life, an amount of decomposable material to the water of a reservoir which must be taken into consideration as an important factor in the exhaustion of dissolved oxygen. Camacho reservoir during the last three years has been distinguished by the rapid growth of Chlamydomonas and Peridinium in sufficient numbers to add a noticeable turbidity and to impart a greenish or brownish tint to the water. Very little trouble has resulted from the development in any of the reservoirs of disagreeable odors and tastes due to the growths of microscopic organisms.

STAGNATION AND PUTREFACTION.

Stagnation and putrefaction of the volumes of water in the reservoirs below average depths of 13 feet have been responsible for more complaints from consumers and the distribution of water of poor quality, from the standpoint of appearance and chemical composition, than any other factors in the water supply system of the Panama Canal.

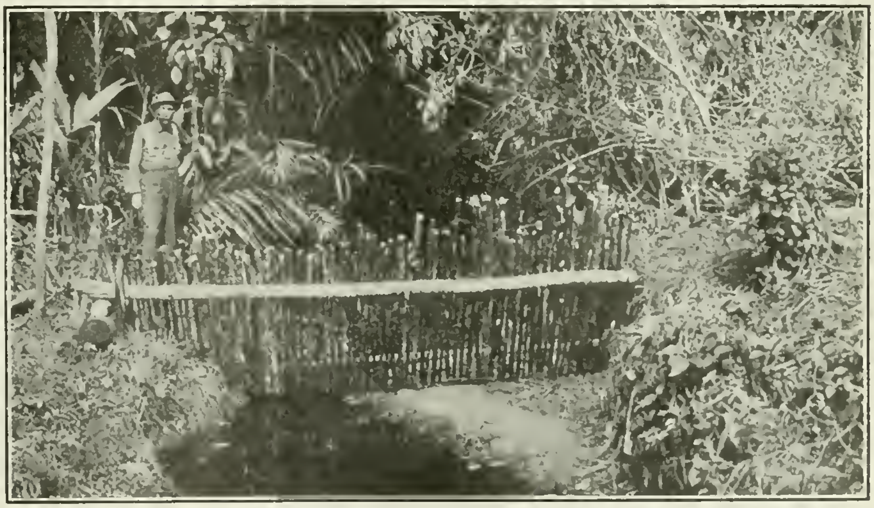
Stagnant layers of water with high color and iron contents and disagreeable odors are frequently found 10 feet below the surface of some of the reservoirs, and at times even closer. While it is advisable to equip reservoirs in temperate climates with floating intakes so that the water may be drawn from any desired level, it is absolutely necessary in the tropics to install an adjustable intake in place of a series of fixed intakes located so as to draw water from the top, middle and bottom. It must be remembered that fixed intakes do not permit the withdrawal of water entirely from the planes of their elevations, but some water above and some below, in fact water all around the intakes, will be drawn upon.

Adjustable intakes are especially essential if the water is not subjected to any purification other than that of storage in the reservoir. Even if it is to be used as a raw water supply for a purification plant, it is advisable to have considerable flexibility in the intaking of the water in order to avoid throwing a heavy load on the aerators. If the purification plant does not include an aeration unit, the use of other than surface water is inadvisable.

All reservoirs in the tropics should be provided with blow-off valves in order to waste the bottom stagnant layers of water after heavy rains, rather than to allow the fresh run-off to waste over the spillway. During the course of a rainy season, it is generally the case that the blow-off valve may be opened several times unless the capacity of the reservoir is small and the water supply is nearly exhausted at the end of the dry season. In such a case (Camacho reservoir for instance), it is necessary to store all of the run-off, and if, near the end of the rainy season, there is sufficient rainfall to start the water running over the spillway, the blow-off valve is opened for a few days. During the last two years it has been opened only once each year. In the case of Agua Clara reservoir, where the water level drops about 5 feet during the dry season and is replaced during the first part of the rainy season, the blow-off valve is opened several times during the last four months of the rainy season. If water is not wasted from the bottom of a reservoir in the tropics, the zone of stagnation will gradually climb nearer the surface. The drain lines from the gate chambers should also be blow off occasionally to remove accumulations of mud.

MAINTENANCE.

At each reservoir a caretaker directs the work of a maintenance gang which cuts the grass around the shore line, cleans the beds of the feeders, clears off the brush and trees growing along the latter and the shore line of the reservoir proper, and takes care of the miscellaneous work which arises from time to time. Daily records of the rainfall and elevation of water are kept.


LEAF CATCHER AT MOUTH OF FEEDER TO AGUA CLARA RESERVOIR.

During the present fiscal year more attention has been given to the feeders than in the past. The banks of a considerable number have been cleared from 50 to 75 feet on either side, which is the minimum distance for permanent improvement and elimination of a large number of leaves. The trees and undergrowth were burned after having dried sufficiently. In other cases only a narrow strip close to the water has been cleared as a temporary improvement in order to eliminate vegetation which would fall directly into the feeders.

It has been necessary to clean the dry beds of the feeders several times during the dry season in order to prevent a large amount of leaves from being washed into the reservoir at the start of the rainy season. The old deposits of rotten leaves and vegetation have been removed from all of the pools, and the pools, if they were not too large, filled with rocks in order to eliminate the growth of algae and sources of high color. In a few cases the skeletons of dead animals were found.

Robert Houston, caretaker of the Agua Clara reservoir, suggested the use of screens set across the mouths of the feeders, and at different points along their courses, for catching leaves and debris washed down by the heavy rains. (One of the screens is shown in the illustration. In the background may be seen the heavy growth along the banks of the feeders, a typical example of all the feeders before the clearing was started. In the foreground is a pool in which highly colored water is developing.) The screens are set at an angle across the feeders in suitable locations, and braced preferably against trunks of trees. Fifteen of these were constructed and placed in position on the various feeders discharging into Agua Clara reservoir before the rainy season started. Sufficient amounts of leaves and debris were caught to justify their use and maintenance.

In the case of reservoirs similar to Agua Clara and Brazos Brook, where there are comparatively small variations in the water level, a large share of the gang's time may be devoted to clearing, but in the case of the reservoirs similar to Camacho and Rio Grande, the regular maintenance gang is required for grass cutting during the greater part of the year. Most of the grass cutting is done by machettes, as the majority of the laborers are accustomed to their use, and the roughness of the ground precludes the use of scythes. At Rio Grande reservoir, where a larger amount of grass is cut than at any of the other reservoirs, scythes are used over the greater part of the shore area, but it was first necessary to smooth the ground by removing the stumps and small rocks. Where the topography of the ground is suitable, and it is necessary to cut large amounts of grass, the work may be done much faster and cheaper by scythes. In some cases the grass is raked back a few feet from the water's edge, in other cases it is loaded on wood frames and carried back from the shore line for varying distances, depending upon the slope of the bank, and dumped in piles. During the dry season the grass is burned, but during the wet season it is allowed to accumulate until the dry season. Where there is a comparatively small variation in the water level of a reservoir, it appears preferable during the wet season to cut only a strip sufficiently wide along the shore line to keep grass of more than 3-inch height out of the water in case the water level is raised six inches or so, because it is impractical to burn the grass, and consequently it soon starts to decay, and the rains wash the organic matter into the reservoir. Likewise it is inadvisable to cut the grass on the banks of the feeders during the rainy season.

In the case of a reservoir like Camacho, where there is a drop of 25 feet in water level in six months and the lowest level is reached during the rainy season, it is necessary to keep the grass cut short over the whole of the exposed shore area in order to be prepared for a sudden rise in the water level after a heavy rain. The amount of organic matter added to the water by rains percolating through the piles of cut grass will be far less than added through the flooding of several thousand square feet of grass a foot or so high.

The maintenance gangs are provided with sanitary buckets, which, at the end of each day's work, are emptied into pits or buried outside the limits of the watershed.

Cutting grass around the Rio Grande reservoir was continued throughout the year, the least amount being in February—32,300 square feet, and the maximum in August—451,130 square yards. The cost varied from 6 to 22 cents per square foot, and totaled $5,111. The highest cost was that of cutting grass standing in water, performed by men working in boats. The cost includes raking the grass back and burning it.

——— Buy War Saving Stamps ———

NEW FEATURES IN BITUMINOUS PAVEMENT PRACTICE.*

Summary of Recent Developments Throughout the Country—No Changes in Basic Methods—Improvements in Methods and Materials.

By CHARLES M. UPHAM.†

Of thirty-five state highway commissioners and engineers and consulting engineers who replied to inquiries by the author concerning any new features in road construction that had been developed within the past few years, thirty-one said that there had been none in basic methods. Even in details of construction and in road materials no radical changes have taken place during the past four or five years. Some new details, however, are very important in that they enable excellent pavements to be produced at a much lower cost than formerly.

In bituminous roads the fundamental requirements are a dense aggregate bonded together by suitable asphalt. The bituminous roads of the mixed process can be generally grouped into two types, namely: Asphaltic concrete type, in which the larger stone aggregate is used; and a pavement of the sheet asphalt type, in which finer aggregate is used. There is still another pavement that greatly resembles these, but creates still another type, that is made up of pulverized clay or other very fine aggregate, saturated with bitumen.

Of the pavements of the type in which large stone is used in the aggregate, very good results have been obtained by Mr. Dean in Massachusetts in his "gravel-asphalt concrete." In this pavement the attempt is made, by various proportioning, to utilize everything in the gravel pit, either in the base course or in the wearing surface. A gravel base of four inches is generally used in the construction of this pavement. The base is thoroughly rolled and filled with sufficient screenings to fill the larger voids but not come quite to the surface of the base stone. The size of the stone in the base course varies from ½-inch to 3 inches. The gravel-asphalt wearing surface is prepared by heating the gravel aggregate and then mixing with the asphalt. The size of the aggregate is between ¼-inch and 1½ inches, and may constitute from 15 to 75 per cent of the total pavement. The remainder of the aggregate would be sand from the same pit, the proportion being determined after an analysis of the gravel. The wearing surface is always spread from dump boards and then rolled until solid. The asphalt used is about 70 penetration and heated by steam coils. Massachusetts is now constructing a large mileage of this type of pavement.

Mr. Everett of New Hampshire has developed a new method of constructing asphaltic concrete which he calls "modified asphalt pavement." This is somewhat similar to the Massachusetts type, excepting that the amount of the larger stone in the aggregate is always less than 15 per cent. This pavement resembles the Topeka mixture with the exception that there is an additional aggregate present larger than is used in the Topeka. The grading of the aggregate is controlled by constantly testing the gravel and making up charts known as control charts. If the tests show that the aggregates are outside of certain limits, new proportions are immediately set.

The requirements of the modified asphalt pavements are as follows:

Mineral Aggregate.

Passing 200-mesh sieve from 5 to 11 per cent
Passing 40-mesh sieve from 18 to 30 per cent
Passing 10-mesh sieve from 25 to 55 per cent
Passing 4-mesh screen from 8 to 22 per cent
Passing 1-inch screen less than 15 per cent

This method has been used for two or three years and is considered very satisfactory. This type of pavement is especially adapted to localities where there are numerous gravel pits.

Several new features have been added to some of the pavements of sheet asphalt type. One that has been reported as being very satisfactory is the use of ½-inch stone rolled into the surface of the sheet asphalt or Topeka pavement. This makes a pavement that is less slippery. Although this has but recently been tried out on a large scale, it was tried out to my knowledge on a few very successful experiments about six years ago. At first glance it would be supposed that the ½-inch stone would soon wear away with the surface of the sheet asphalt, but as a matter of fact this stone seems to be driven into the surface as well as worn away. On a moderate-traffic roadway it has been found that considerable of this ½-inch surface stone was still in the surface even after four years' use. Probably the most successful way of applying this stone is to first heat the chips and apply them before the pavement has become thoroughly cooled, which then allows the stone to be slightly rolled into the surface. The size of the stone should be from ¼-inch to ¾-inch.

Another pavement of the mixed type that is reported to have been laid successfully is one in which pulverized clay is used in the aggregate. This clay has the property of absorbing considerable asphalt, and in some samples as much as 18 per cent of asphalt has been found. It has been claimed that the asphaltic material penetrates the clay until it is in a saturated condition, which makes the pavement practically waterproof and very dense. At first there was some difficulty in the physical making of this pavement, but I understand that this has been overcome. It has been reported that this pavement has been laid successfully on an earth foundation.

Another pavement of the mixed type which a short time ago created a great interest was what was known as the "fibred asphalt pavement." This was made by mixing small pieces of wood fibre (which is the refuse from tanneries) with sand and asphalt. Experiments carried on in Wilmington proved that under certain conditions this would make a very satisfactory pavement if made up in this manner. The test piece, though small, had stood severe traffic for over a year, at which time the entire street was replaced with a new pavement. The theory of this pavement is that the moisture has been extracted from the wood fibre and the asphalt will penetrate the wood and form a wearing surface which when compressed would approach wood block pavement. I understand that some of this pavement has been laid in West Virginia.

A pavement that has not become generally used but is very interesting on account of being radically different from most pavements, is what is called "Strenolith." This is supposed to be made of sand, oxide of iron and resin. A few years ago a sample was submitted to our laboratory. It had the appearance of brown stone and was very hard. It had been used as a base somewhere in

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*Part of paper before St. Louis convention of American Road Builders' Association.

†Chief Engineer, Delaware State Highway Commission.

New York City, where I understand there is an entire block of this pavement. Very little is known of the exact analysis of this type or its practicability from standpoint of costs. In view of the increased price of materials of construction it may be worthy of investigation and consideration.

There have been very few new features under the head of bituminous penetration. Among those that have been brought to notice is one devised by Mr. Shirley of the Maryland State Highway Commission. The first course of this pavement is constructed as for a water-bound macadam. The top course is thoroughly rolled and compacted and then covered with a coat of trap rock screenings, varying from dust to 1-inch pieces. Upon this is spread a coat of tar, of the consistency that will run when cold, in quantities from .6 to .75 of a gallon per square yard. It is necessary that this tar be evenly distributed. Upon this tar material is uniformly spread another light coat of screenings. This is then rolled until the entire surface presents a smooth and even appearance. The last coat of screenings is sufficient to prevent the tar from adhering to the wheels of the roller. After this has been spread and rolled thoroughly, there is applied .6 to .75 of a gallon of asphalt, applied cold. On this coat of asphalt is spread stone chips ranging from 1-inch to ½-inch in size. This is rolled until the surface is smooth and shows no effects from the passage of vehicles. All the screenings or chips are applied from piles or wagons with shovels, and extreme care is taken to keep the surface during construction free from ruts, depressions or waves. This construction has been used for about two years in Maryland and has been found to be very satisfactory.

Another penetration method has been developed by Mr. Hirst of Wisconsin. The construction is very similar to that of water-bound macadam, except that the last course is not filled with screenings but is nearly filled with stone chips. Into this is poured ½-gallon of light tar or oil and covered with ¾-inch chips, enough of the latter being put on to keep the roller from picking up the asphalt. After rolling, another half-gallon of bitumen is applied and covered with more chips. After this is rolled it is covered with ¼-gallon of material and covered with small chips. It is stated that this work costs very little more than water-bound macadam, and offers an excellent foundation for subsequent bituminous treatment.

There are a few new types of pavement that can now only be considered in the experimental stage. Among them is one that is new, and, while it does not seem from the nature of the ingredients that the pavement could be permanent, it has given good results up to the present time. This pavement consists of the use of straw, sand and asphalt, made up by the layer method.

A new feature in a base course for a wearing surface is contained in a sample laid in Florida and several sections around Philadelphia. This base is made by neutralizing the acid condition of the soil used in its construction and then mixing it with a new kind of cement. It is claimed to be cheaper than Portland Cement, and almost any class of material can be used as the aggregate in the base course.

A new feature in the maintaining of bituminous surfaces has been developed recently. It consists in an application of bituminous material to the surface and then covered with sand and fine chips. In the case of bituminous concrete that has been laid for several years and presents a worn surface with the aggregate exposed, exceptional results have been obtained by rejuvenating this bituminous concrete with a light bitumen. Many cut-back products have been developed for this purpose. One very satisfactory product has been applied in two applications. The first, an asphalt cut-back of a very fluid consistence, is applied to the pavement and allowed to dry out for three or four hours. Directly upon this is applied a cut-back of medium consistency, which is covered with sand immediately. Excellent results have been obtained where this method has been used.

Recent advances in the prices of lighter oils used in making up the cut-back flush-coat materials have demanded experiments whereby cheaper materials can be substituted for the light oils. A new feature in this line is the use of an emulsified asphalt whereby water takes the place of the light oils used in cutting back the asphalt. When the emulsified asphalt is used, only one application is made. I have been informed by one of the producers of this emulsified asphaltic material that it has worked very satisfactorily in rejuvenating old city pavements and that excellent results have been obtained on road work. A little longer time is required for the water to dry out, but the purpose of the operation, which is to seal the fine hair cracks and cover the exposed aggregate surface with asphalt, is accomplished. This has been tried out on highway work with the same success as in city pavement.

The use of what is called cold-patch material is common in certain localities, but I find there are other places where this has been used very little if any. A new feature in this respect is to patch the ruts or holes with a mixture made up of coarse sand or stone and an emulsified or cut-back asphalt. This mixture can be prepared without heating the aggregate and the mixture can be tamped or rolled while in a plastic state, and after drying out will present a hard, firm patch. Cold-patch materials are made up with both tar and asphalt as a base.

A few new features in bridge work that have helped to overcome the difficulty in keeping the plank floors of bridges in good condition have been recently reported. Several ways of treating plank have been evolved with only partial success. The location of many country bridges, as well as their size, would not warrant an expenditure of any great amount for the construction of a protective coating over the plank floor. The use of an asphaltic concrete wearing surface made up of stone and sand and an emulsified asphalt has provided at a moderate cost a wearing surface for bridges that is both substantial and inexpensive. Many times the aggregate can be secured locally and the asphalt mixture made without heating. On account of the character of the asphaltic mixture, it can be put down by tamping it into place. The material may be mixed either by machine or hand. The ingredients that are proving to be most successful are a mixture of stone chips ranging from ¾-inch to dust with the emulsified asphalt. It is stated that this mixture readily packs under traffic and forms a mat that resists the wear of traffic. Considerable of this work has been done under ordinary conditions at 30 cents per square yard. The thickness of the mixture should be 1 inch or 1½ inches.

Discussion.

By Charles Carrol Brown, of Municipal Journal.

One or two additions may be made to the new developments mentioned by Mr. Upham which seem to be of considerable importance.

Warren Brothers Company has developed a method of application of seal coat in connection with the construction of its pavements, taking the place of the old method of application of flush-coat bitumen and dry aggregate spread thereon. The new method consists of incorporating hot bitumen and aggregate in the mechanical mixer in which the wearing surface mixture is made; spreading this seal-coat mixture to a depth of about ½-inch (loose measurement) over the wearing surface mixture after the latter has been raked to the proper depth and grade, but before rolling the wearing surface, then rolling the two courses together with a three-wheel road roller. An additional quantity of the seal-coat mixture is spread over any portion of the wearing surface which the first rolling shows has not been completely covered with the seal coat. The rolling is continued until the wearing surface and the seal-coat mixtures are both thoroughly compressed and blended together.

The seal-coat mixture is made of aggregate (either sand or crushed screenings), all of which will pass a No. 4 screen and containing about 25 per cent of material passing a No. 80 and finer screens. The asphalt cement varies in penetration with climatic conditions, but is about 25 degrees softer than the asphaltic cement used in the wearing surface mixture. The mixed-method seal-coat mixture contains from 12 to 14 per cent bitumen soluble in carbon bi-sulphide. When completed, the seal-coat mixture has a thickness of about one-fourth inch over the top of the particles of stone in the wearing surface and is pressed and blended into the wearing surface to a depth of about one-fourth inch.

The advantages claimed for this mixed method over the flush-coat method of seal coat are that the entire material used in the mixed-method seal coat is available for permanent wear, while the greater portion of the dry aggregate used in the flush-coat (otherwise known as "squeegee") method quickly grinds up under traffic, washes and blows away and adds nothing to final wearing properties of the pavement. Also the seal coat of rich, soft bituminous mixture is very malleable and provides conditions for the greatest possible efficiency in waterproof wear-resisting properties. It does not increase the cost, the quantities of materials used in both cases being practically the same. The company began using this about four years ago and has used it in most of its work during the past two years.

Another pavement has been tried out by this company during the past six years, in which, while the concrete base is still plastic, there is placed on it a bonding course made of stone passing a 1-inch and retained on a ½-inch screen combined with one-sixth its volume of cement made plastic with water, which material is spread to a depth of 1½ inches and rolled lightly so that it is pressed into the base to a depth of about ½ inch. As soon as the cement in the bonding course has set, the surface is flushed with a hot mixture of asphaltic cement and very fine sand in about equal proportions, so as to fill all the voids and coat the entire surface of the pavement with about ¼-inch of rich, malleable, waterproof bituminous cement. On this is spread ¼-inch of stone screenings or coarse sand. This produces a concrete base and rich bituminous surface firmly bonded together. It requires about 2½ gallons of asphaltic cement per square yard. The name "Bitustone" has been given to this pavement.

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REMOVE SNOW FROM NEW YORK HIGHWAYS

At a meeting of the Highway Traffic Association of the State of New York, on February 19th, resolutions were adopted requesting the State Legislature to adopt amendments to the state highway law providing that "the state commission of highways shall cause the removal of snow from the roadways of trunk line highways connecting cities and those connecting industrial centers and cities when the accumulation of snow thereon shall render such highways unsafe or unserviceable for loaded vehicles;" and that "there shall be annually appropriated for the removal of snow from trunk line highways an amount sufficient to provide therefor, based upon the estimates prepared and submitted by the commission to the Legislature as provided in" the existing highway law.

This action by the legislature was considered essential because the U. S. Quartermaster's Department has found it necessary to use the trunk highways for transporting army supplies; economic transportation by motor trucks requires that the roadways of trunk highways be maintained at all times of the year so as to permit of free and easy travel, and the accumulation of snow interferes with, and in many cases makes impracticable, economic highway transportation by motor trucks.

Others in the state have felt that New York has been remiss in this matter during the past winter. Among others, H. H. Franklin of Syracuse, in a letter to Senator J. Henry Walters, has said:

"Whatever the cause for the present railroad situation, there is absolutely no good reason why state highway transportation should be tied up. Perhaps the biggest help New York State could give the country at this time would be to promote highway transportation.

"Certainly it does seem that we should at least keep the great highways open. War or no war, it is absurd that roads built at such heavy expense should be largely out of use four to six months of the year.

"Keeping the roads open during the winter is not new. It was done before the war by the State of Connecticut and is still being done."

Buy War Saving Stamps

OPERATING SMALL SEWAGE DISPOSAL PLANTS.

Features Peculiar to Small Plants—Recommendations for Operation of Imhoff Tanks—Foaming, Scum Prevention and Removal.

At a meeting of the New Jersey Sewage Works Association on February 15th, Geo. W. Fuller read a paper entitled "The Operation of Small Sewage Disposal Plants" which contained much excellent advice, and especially full suggestions concerning operation of Imhoff tanks. "Small plants" he defined as those of such size that the superintendent or man in immediate local charge is obliged to attend to all operations other than those that can be performed by the better class of common laborers. The man in charge is called upon to make such laboratory tests and attend to such mechanical appliances as are necessary, with little or no technical aid after the schedule of operations once becomes established. In this paper, the author had in mind only plants receiving the flow of separate sewers, with practically no trade wastes or street washings—conditions found in practically all of the plants in New Jersey.

He emphasizes the importance of each plant operator keeping a daily record of the more important items connected with the operation of his plant; these ordinarily including volume of sewage treated, stability of effluent (by the methylene blue test), volume of solids in influent and effluent portions of the plant in service, withdrawals of sludge from any portion of the plant, condition of filters, quantity of chlorine applied, if any, and such other tests as will indicate at a later date what the plant performance was at any given time. Also notes should be made concerning any abnormal features connected with the operation of the plant, such as odors, flies, filter clogging, etc. It is desirable that the operator study the behavior of his plant at different seasons of the year, and keep a diary in which to record his observations on various special points. Seasonal conditions may affect results considerably, but unless notes have been made of such conditions in the past it will be impossible to compare with moderate accuracy the effects observed during one season with those encountered during a similar season of previous years.

IMHOFF TANKS.

Small plants, as distinguished from large ones, generally receive sewage in which the suspended matter arrives in a coarser condition, due to less opportunity of comminution because of the smaller collecting system and less duration of flow. As a result, the operator of an Imhoff tank for a small city usually has to contend with far more scum than is found at a plant for a large city. On the other hand, he is spared the difficulties connected with grit chambers for the removal of mineral matters washed from the streets. In addition to the less comminution of the coarser materials, he often finds these mixed with kitchen wastes which should have gone to the garbage can and with grease that tends to bind the particles together. At the new army cantonments, single-story tanks have been built partly in the interest of speed and economy of construction and partly in recognition of the flotation aspects of the sewage, which reaches the tank in a very fresh condition.

Plants that receive only a relatively small amount of sewage in the earlier months of their operation behave far better than do those that have a relatively high load factor at the outset. This goes to confirm the general belief that sludge-digestion chambers should be made materially larger than was believed in earlier years to be necessary. Dr. Imhoff himself had apparently reached this conclusion in 1916, when he prescribed that for towns of five thousand population or less, having separate sewers, there should be a sludge digestion capacity of at least 2.4 cu. feet per person. Mr. Fuller believes that this is none too large and implies that even a greater capacity might be desirable. He also believes that sludge beds should be much larger than was originally prescribed by Dr. Imhoff, probably because he had not given due consideration to the intensity of rain-fall in this country.

The operator of an Imhoff tank should see that deposits do not occur in the inlet channel nor upon the sides and sloping bottoms of the flowing-through or upper compartment of the tank, but these should be removed with convenient tools twice a day or oftener and pushed through the slot into the sludge-digestion chamber. These and other recommendations which were discussed at some length by the author were summarized by him as follows:

Summary of Operating Experiences with Imhoff Tanks.—1. Small plants of the Imhoff tank type, receiving the flow of separate sewers, are frequently more difficult to operate than larger ones receiving the flow of combined sewers, because the relatively large size of the suspended particles reaching the digestion chamber respond for long periods at a time to flotation rather than sedimentation.

2. Careful attention to the prevention or frequent removal of stranded solids in the collecting sewers, inlet channels of the tanks and on the bottom and sides of the upper or sedimentation compartment; to the uniform distribution of solids in the several sections of the tanks; to the frequent removal of grease and scum from the surface of the sedimentation compartment, is helpful and important. But it will not necessarily eliminate abnormally long periods for the "ripening process," following which well digested sludge is obtained without objectionable odors.

3. Normal digestion of sludge to an inodorous humus mass, with a fairly uniform liberation of the resulting gases caused by the inevitable splitting apart of carbon, hydrogen, nitrogen and sulphur atoms contained in the complex molecules of suspended organic substances, is seemingly effected by enzymes or liquid ferments excreted by certain kinds of bacteria.

4. When tanks are new, and when for any unforeseen reason old tanks lose their efficient digestive functions, ordinary bacterial decomposition predominates over enzyme digestion, with attending possibilities as to odor complications from incompletely digested sludge, or from the release of intermediate decomposition products, particularly those of a sulphurous nature, or from both. Tanks in this condition are said to be undergoing the "ripening process," which fortunately does not seem to be necessary as a rule other than with new tanks, although there have been some exceptions to this general experience.

5. There is no way of telling in advance how long a period of ripening may be necessary for a given tank, as different results come in different units of the same plant. Some kinds of bacteria grow prolifically and preclude the development of suitable enzyme-producing bacteria as a result of "bacterial antagonism" caused by the excretion of waste products. This may be as capricious a matter as the occurrence of weeds in a field or of algae in an unpolluted lake. "Seeding" a tank with ripened sludge from another tank has not proved to be as reliably helpful as was expected.

6. Objectionable odors may arise in varying degree, depending upon local factors, but largely upon the lack of opportunities for absorption of odoriferous compounds by surrounding water and upon accumulations of gas which may be released intermittently in masses or "whiffs," so to speak, following barometric changes and interruptions in free venting.

7. The secret of success in operating Imhoff tanks is to retain in them relatively small quantities of decomposing solids and to do all that is practicable to secure a proper balance between enzyme liquefaction and bacterial decomposition, with a predominance, of course, of the former. This explains why tanks receiving only relatively small quantities of sewage when new do so well in digesting sludge. It raises the issue of sludge storage capacities.

8. Quiescent masses of sewage solids, either scum or bottom sludge, are scarcely capable of satisfactory decomposition, as antagonistic products of bacterial life seem to have a decidedly retarding effect.

9. Lime will lessen excessive acid formation in sludge, but it will scarcely cause the establishment of the right kinds of bacteria for enzyme production. In fact, it may result in increasing abnormalities.

10. Agitation through pressure-water jets or paddling may be of aid, and in Europe mechanical stirring devices have been proposed. The benefit of stirring and mixing seems to lessen with increasing volumes of sewage solids in a tank, due to a loss of efficiency of the stirring arrangements. This step, if carried too far, may also remove entrained gas to such an extent that non-gaseous, sticky, foul-smelling sludge is obtained under circumstances requiring its removal and burial or treatment with a deodorant.

11. Acid foaming at gas vents sometimes becomes very bothersome where the gas vents contain large quantities of floating scum undergoing bacterial decomposition in the absence of adequate enzyme digestion.

12. Slot trapping by gas and gas-lifted solids, which fill the space above the slots, frequently accompanies foaming and may carry decomposing solids into the settling compartment from the sludge chamber below as well as by overflowing from the top of the gas vents.

13. Overflowing from foaming cannot be stopped in some tanks, even if the gas vents extend 5 or 10 or more feet above the flow line. High free board, hosing with pressure water, stirring and liming, all tend to help, but collectively may not be a prompt cure. Aggravated cases are not cured by putting a tank out of service for months. In some tanks sludge removal from the bottom affords a remedy, but this is not available for tanks containing most of the solid matter in a floating condition. The surest remedy then is to remove the great bulk of floating solids from the gas vents until only small quantities remain. Obviously such removal must be done in a way to minimize offense.

14. Scum storage for floating solids above the elevation of the slot should be provided for much more liberally than hitherto for small plants, expected to receive during the first year of their operation a substantial proportion of their normal daily quantity of sewage.

15. Scum removal may be necessary in some plants even where there is fairly liberal allowance for scum storage. It depends partly on intensity of gasification, partly on the adhesiveness (gas-retaining capacity) of the scum, and partly on the success attending efforts to make portions of the sludge remain in the lower part of the digestion chamber. In aggravated cases, scum removal is imperative, but it should be carried out with caution.

16. Scum prevention comes about in some degree through comminution incident to pumping and may be further aided through the use of screens. Sometimes screening is provided in front of pumps. At Rochester, N. Y., the flow of a gravity outfall sewer now passes through a fine screen on its way to Imhoff tanks. Similar provision has been recommended at Plainfield, N. J. Such a step adds materially to the cost of sewage treatment, but evidence at Reading, Philadelphia and Chicago, shows that it reduces scum formation to a substantial degree. Its advisability for a given project depends upon whether the need is commensurate with the cost.

17. Normal Imhoff sludge is dark-colored, practically inodorous and shows a curdled appearance when it flows in a thin layer down the side of a container. Much difficulty with odor has followed the withdrawal of undigested sludge to a drying bed and an operator should carefully note the condition of the sludge before and during its removal. But difficulty has also resulted from retaining sludge for a year or more in a tank under conditions where suitable enzyme digestion does not prevail. Such sticky gray or yellowish sludge may be foul-smelling, but it is wisest in some cases to remove it, with greatest care taken to prevent nuisance from odors. Complete digestion is not always attainable.

18. Sludge storage capacities are provided for more liberally than formerly and with good reason. It is not unusual to find extremely thin or dilute sludge in a digestion chamber and this high water content is quite a factor in causing a demand for larger sludge chambers. Another item is the relatively long period of cold weather during which little or no sludge can be removed. This applies particularly to northern plants put in service during the late summer or fall.

19. Sludge beds should be at least double the areas recommended by Dr. Imhoff, due to the frequency and intensity of rainfall in our northern States—unless covers of the hot-house type should be provided.

20. It is well to empty idle tanks and conduits; otherwise offensive odors may ensue.

CHLORINATION.

Mr. Fuller's experience leads him to the conclusion that chlorine devices, if kept in service uninterruptedly, make more of a demand on the operator than was expected a few years ago. Duplicate parts are needed to a substantial extent and it would be preferable to have complete duplicate devices for small plants. Another important point for the operator who seeks efficient chlorination at all times is to see that the minimum dose applied is sufficient to do its work when the fluctuating sewage requires its maximum dose; subject, of course, to reasonable adjustments as between day or night flows, and discharge of trade wastes, if such are a factor.

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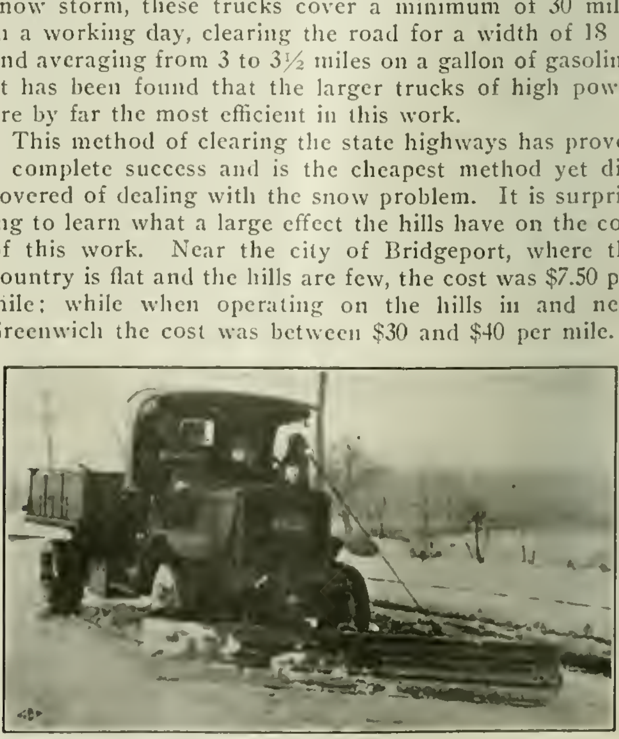
KEEPING CONNECTICUT ROADS OPEN.

Connecticut now has a law requiring the Highway Commission to keep the state roads open at all times of the year, and the conditions of the winter now departing have given the commission a strenuous time in endeavoring to comply. One of the most important of the highways is the Boston Post Road, from New York through Bridgeport and New Haven. The keeping of this road clear of snow was the duty of R. M. Donnelly, commissioner of repairs.

The snow on this stretch was removed by use of four motor trucks equipped with adjustable snow plows. The two larger of these trucks were built in Bridgeport. The plow blades are of steel and are 10 feet long and 14 inches wide. They are hung on a semi-circular steel frame which is operated from the seat of the truck by a hand wheel and heavy chains. With this arrangement it is possible to set the scraper blade to either a right or left hand angle so the snow can be plowed either toward the center of the road or toward the gutter. There is an automatic blade release so constructed that when the cutting edge strikes an obstacle such as a manhole cover or car track the blade releases to pass over the obstacle and then immediately returns to its operating position.

In clearing the highways in the country, two trucks are used in tandem formation and about a block apart to obviate the danger of absolutely blocking all traffic behind. The truck in the rear follows to the right or left of the forward truck, catching up the snow in its wake and throwing it and the snow untouched by the first truck further to the side of the road. After the heaviest snow storm, these trucks cover a minimum of 30 miles in a working day, clearing the road for a width of 18 ft. and averaging from 3 to 3½ miles on a gallon of gasoline. It has been found that the larger trucks of high power are by far the most efficient in this work.

This method of clearing the state highways has proved a complete success and is the cheapest method yet discovered of dealing with the snow problem. It is surprising to learn what a large effect the hills have on the cost of this work. Near the city of Bridgeport, where the country is flat and the hills are few, the cost was $7.50 per mile; while when operating on the hills in and near Greenwich the cost was between $30 and $40 per mile.



SNOW REMOVAL ON CONNECTICUT ROAD.

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THE SUPREME WAR CONSERVATION.

Food, munitions, ships, money and men: these are the essentials to the work in which all the efforts of patriotic Americans are centered and must be for months or years to come. Food production can be and is being increased greatly; that of munitions and ships has in a few months grown to enormous proportions. As to money, this country contains thousands of men who can say: "Making money is the easiest thing I do."

But men—strong, husky, virile, brave men—we need not only for fighting, but also for producing all the other necessities. In proportion as we lose men, we will fall behind in every phase of our war program. From now on, every loss of an effective man, either here or "over there," weakens the punch of our fighting line.

Conservation of food, of fuel, of ships, of money is a universal duty that has been brought home to all of us. But back of all these is the duty to conserve men. Given the men, waste or loss of these other things can be replaced in a few months. But if man power fails us, the Almighty himself can not replace the loss inside of eighteen or twenty years, and by that time the war—or civilization—will be ended.

Conservation of men, therefore, is the supreme duty. Since new workers can not be created, everything depends on saving the lives of those we have; and that is better also, since we save not only the man, but also his training and what it has cost.

But saving lives is not the only possibility open to us. Lives are of value to the nation only as they represent useful work done, and we must preserve and even increase the ability to perform such work. A worker full of health and vigor is easily worth two sickly ones, and to the extent that we prevent or remove sickness we in effect provide two workers where there was but one before. If but one-fifth of the workers are brought from the sickly to the vigorous class, we thereby add ten per cent to our man power.

If the above is true—and we do not see how it can be questioned—then those entrusted with the directing of public affairs and the expenditure of public funds have imposed upon them no duty more imperative than that of maintaining and improving sanitary conditions wherever it lies within their power. More than ever, preventable sickness and deaths in any community are a disgrace to that community; they are more, they are a crime against the country.

Public works that use labor, materials and money unnecessarily should be halted until the war is won. But among these can not be classed those that contribute to the health of the community. Safe water must be provided, its purity being guarded until it reaches the consumer; and by sewage and refuse removal the dangers connected with the retention of these matters in communities must be eliminated. Every efficient man is worth $10,000 to the country just now, and it costs that much to kill one of the enemy. There are few cities that can not, by improving their sanitary conditions, save several lives for every $10,000 spent. And the use of labor, materials and money for the saving of those lives is the most important aid to the country that our cities can render at this time.

—— Buy War Saving Stamps ——

MUNICIPAL BONDS.

According to the "Daily Bond Buyer," of New York, the sales of municipal bonds during February totaled nearly two million dollars higher than during January, or a little under twenty million dollars. This is the more encouraging because only twice during the past ten years has the February total exceeded the January, and on the average during those years the February sales totaled forty per cent less than the January. The sales last month were about seventy-five per cent of the average for the last ten Februarys.

Not only did the sales increase, but the prices were better than a few weeks ago. Apparently the chief factor in causing the improved condition is the feeling that the supply of new bonds this year will be materially reduced as a result of the influence of the Capital Issues Committees, at least issues of $100,000 or more. "The feeling is growing that, if the supply of these tax-free and trouble-free bonds is reduced in any material amount, values will improve in spite of new Liberty Loans carrying higher interest rates."

—— Buy War Saving Stamps ——

GARBAGE UTILIZATION AT HOME.

Much has been said by us and others recently concerning the utilization of garbage by turning it into pork products. Pig-raising for this purpose has been treated as a community project, for two very good reasons; first, because it is so difficult to prevent the individual pig-pen from becoming a nuisance in a thickly settled district; and, second, because a single family does not (or should not) produce enough garbage to feed even a single hog.

It seems to be impracticable, as well as wasteful, to burn garbage in the range of the home without both difficulty to the one operating the range and also the emission from the chimney of odors objectionable to the neighbors.

Any one who has a resonably large yard at his disposal, however, can utilize his garbage, whatever the amount, by feeding it to chickens, and thus transform it into eggs and meat. And only reasonable care is necessary to prevent the raising of chickens from causing any objectionable odors, and few cities or towns have ordinances against it. It is true that some additional food must be purchased, but chickens will eat to advantage all the ingredients of fresh garbage, and if the number kept is maintained at that which can profitably dispose of the average amount of garbage available, the returns from the chickens will much more than repay both the cost of food purchased and the few minutes a day devoted to the care of them.

Like growing a back-yard garden, the raising of chickens will be profitable only if intelligence is used, care is taken to learn the proper methods, and systematic attention is paid to the work. But, also like vegetable gardening, chicken raising will be a patriotic food measure as well as profitable. Incidentally, the chickens will furnish a fertilizer that will be of no inconsiderable value in the gardening.

The United States Department of Agriculture will, at your request, furnish you with instructions for back-yard poultry keeping.

——Buy War Saving Stamps——

WAR DEPARTMENT FAVORS ROAD CONSTRUCTION.

A few weeks ago, Wm. Sohier, chairman of the Massachusetts Highway Commission, received, in reply to an inquiry addressed to the War Department, an answer from Major Gen. W. M. Black, chief of engineers, in which appeared the following paragraphs:

> The requirements of a military highway do not differ in any material respect from those of a highway for modern commercial purposes. The character of the roadbed should in general be the same as for modern commercial highways, and in general a road designed for modern commercial purposes would serve well for military purposes. In practically all cases roads which are valuable in a military way are those connecting important commercial centers.
>
> As to the question of what military roads must be prepared to carry in the way of traffic, it may be stated that our existing ordnance liable to accompany a field army will have its heaviest representative in a twelve-inch howitzer, weighing about 27,000 pounds, 18,600 of which are on the front wheels and the remainder on the two back wheels. The wheel base or distance between the front and rear axles is eighteen feet; width of truck, seven feet four inches; width of tires, eight inches; width of tire shoes, twelve inches. This howitzer is to be drawn by a seventy-five-horsepower caterpillar tractor, weighing about 25,000 pounds. Comparison with the largest commercial trucks shows that a road substantial enough for such will suffice for the ordnance load.

Another army authority, Major Gen. Leonard Wood, says regarding military roads:

> A systematic, well-planned network of roads which can be regularly used commercially is not only a good investment, but may be of tremendous value to our military forces. While hastily or improperly built roads should not be rushed at this time on the chance that they might be of some strategic value to our armies, substantial highway construction of economic value should not be curtailed because we are at war. Through routes connecting centers of production or population aid in the prosecution of the war by providing additional facilities for transportation of men and supplies.
>
> To be of value to armies in campaign, roads should be paved for a width of not less than eighteen feet and preferably twenty feet, and the total width between inside edges of ditches should be at least thirty feet. This will provide for two lines of motor trucks, and allow a space on either side for emergency repairs of broken-down vehicles or the movement of troops. Low grades are, of course, very desirable.
>
> In conclusion, I would urge consideration of road construction, particularly in those localities where important fortifications exist with no first-class connecting road. No one can foresee the outcome of the present crisis, nor those crises which may follow. These matters of preparedness which can not be handled overnight should be considered well beforehand.

——Buy War Saving Stamps——

CITY TO RENT TRACTOR.

The city of Sacramento, California, proposes to rent out the tractor that it owns when it is not being used on city work. It will ask a rental of $25 per day or $3.50 per hour for the services of machine and operator. The city commissioner made this decision a few days ago on recommendation of commissioner of streets D. W. Carmicheal.

——Buy War Saving Stamps——

FEEDING CITY GARBAGE TO HOGS

Information and Instructions Furnished by the U. S. Department of Agriculture—Feeding Garbage—Diseases of Pigs—Plant Layout.

The United States Department of Agriculture is studying the matter of feeding city garbage to hogs, including the best method of handling, feeding and fattening stock, the most efficient and sanitary arrangement of equipment, the comparative value of garbage as a hog-ration, and the economy of garbage disposal by feeding to hogs as compared with incineration, reduction, dumping, or burying. As a result of a preliminary investigation, it has issued circular No. 30 dealing with the subject and having the title "Disposal of City Garbage by Feeding to Hogs," copies of which may be obtained from the Division of Publications of the department. This circular consists of eight pages of reading matter and a proposed plan for a pig-raising farm or plant. This plan we reproduce herewith, and give below a fairly complete abstract of the text.

While many people recognize in hog-feeding the possibility of a cheaper disposal of garbage than by reduction, incineration, or dumping, there is no reliable and complete source of information on the subject. The report of a special commission on the "Collection and Disposal of Municipal Wastes" for Worcester, Mass., shows the cost per capita per annum for the collection and disposal of garbage in 17 cities of the United States. Seven of these feed their garbage to hogs, while the other ten dispose of it by other methods. The average cost per capita per annum for those feeding garbage was about 11.6c, and the average cost for the other ten was about 33.7c. If these averages should be confirmed by reports from a large number of cities, it would seem that using hogs as garbage converters would save directly to the cities of the United States enormous sums of money and add greatly to the meat supply of the nation. At no time in our history has the elimination of waste been a more emphatic necessity than at present. Entirely aside from the economy effected, if the garbage produced in cities and towns can be used profitably in pork production, every effort should be made to convert it to this purpose.

The report states that sufficient analyses have not been made to warrant a definite statement regarding chemical composition or feeding value of garbage as compared with grains or commercial foods. While garbage-fed hogs sometimes are docked from one-quarter cent to one cent per pound in the eastern markets, this discrimination is not universal. It is a frequent observation that hogs fed exclusively on garbage or swill have a softer and more oily flesh than grain-fed hogs. Decayed or badly fermented garbage is likely to cause strong and rancid pork. But if garbage is fed in good condition with proper surroundings, there is no reason why pork from this source should not compare favorably with that from grain-fed hogs.

The report contains some information concerning the collection of garbage, all of which is familiar to readers of Municipal Journal. As to the quantity of garbage consumed, it states that approximately 15 to 25 pounds of garbage per day are required for growing a hog of 125 to 200 pounds, depending upon the character of the garbage. It has been estimated that four tons of garbage are required to grow a pig to 200 pounds, the feeding period extending over 10 to 12 months.

A common practice in feeding is to dump the garbage on feeding floors as early as possible in the morning and admit the fattening hogs to it. These are permitted to remain until the afternoon, when the sows and young stock enter and clean up the floors during the night. In the morning, the feeding floors and sleeping quarters are cleaned of refuse garbage and manure before the fresh garbage is unloaded. This refuse may be disposed of by placing in compost piles or by spreading upon the land at once. The former method is very satisfactory; if the latter is employed, the material must be plowed or covered promptly or it will soon become a nuisance.

COOKED VS. RAW GARBAGE.

The cooking or sterilizing of garbage is good practice because it makes possible the separation of the grease contained, which some feeders claim does not add to the feeding value and is in part injurious to the hogs. This grease is sold for from 10 to 14 cents per pound and in the larger establishments is an important source of income. Cooking also removes all danger of infecting hogs with disease germs or parasites, such as tubercle bacilli and trichinae. On the other hand, cooking is an expensive operation and is regarded by many successful feeders as useless and even injurious, partly owing to the formation of organic acids. Cooking the garbage causes all the material contained to be so thoroughly mixed that it is impossible for the hogs to practice selection in eating. The argument is advanced that a hog will balance his ration on raw garbage, whereas if the material is cooked he is compelled to eat everything without regard to his appetite. It would seem from the information obtained thus far that cooking is not essential in summer if garbage is clean and is fed promptly. However, the practice is advisable in winter, when the garbage contains a higher percentage of grease which can be removed in the cooking process. When a part of the garbage is frozen, cooking renders it more palatable and available, at the same time making it possible to supply young stock with warm feed.

RELATION TO DISEASE.

Garbage-fed hogs are exceptionally free from lice and intestinal parasites, and when fed upon sterilized or cooked garbage they have been found to be as free from disease as other hogs bought in the open market. Some feeders have reported a very low percentage of tubercular or trichinae-infested hogs where only raw garbage is used, while in other instances pronounced tubercular and trichinae infestation has been found. It is a noteworthy fact that hogs are very susceptible to bovine tuberculosis, and therefore it is unsafe to feed raw garbage which contains milk from any but healthy cows. Similarly, while it is true that numerous garbage-fed hogs have been found to be free from trichinae, if garbage contains raw pork scraps, the hogs feeding upon that garbage are sooner or later sure to become infected, as statistics have shown that 1.4 per cent of all hogs slaughtered in the United States carry the trichina parasite in some stage. Therefore while it might be possible under the most careful and sanitary measures to feed raw garbage with freedom from disease and parasites, still as a precautionary measure sterilization or cooking is advised.

Owing to the nature of the feed, garbage-fed hogs require very careful protection from cholera. Unless the premises are kept in the most sanitary condition and all refuse food is collected and disposed of carefully and promptly, cholera is likely to cause serious loss. However, with proper sanitation, innoculation, pure water, and exercise, cholera need not cause serious loss.

The presence of dishwater in garbage usually results in digestive and intestinal disorders caused by the alkali washing powders. Frozen garbage should never be fed, as it usually causes death to the animals consuming it.

All glass should be removed, if possible, to prevent slitting of the intestines.

Decayed or fermented garbage will cause serious digestive disorders if fed in appreciable quantities.

Treatment for Cholera.—The majority of eastern feeders practice the simultaneous treatment for cholera vaccination which may be accounted for by the fact that the premises are thoroughly infected with hog-cholera germs. Under the most sanitary practices the single treatment may be sufficient to keep the herds free from disease. If the feeder observes signs of an epidemic, the premises should be cleaned immediately, disinfected, and all animals from 2 to 3 weeks up, vaccinated.

BREEDING STOCK.

It is a current opinion that "garbage-bred" stock is essential to a successful feeding establishment. Grain-fed stock is subject to digestive disorders when transferred to a garbage ration. The most successful feeders usually maintain their own herds of breeding stock and in this way their pigs are raised upon and thoroughly adjusted to a garbage ration when the fattening period arrives.

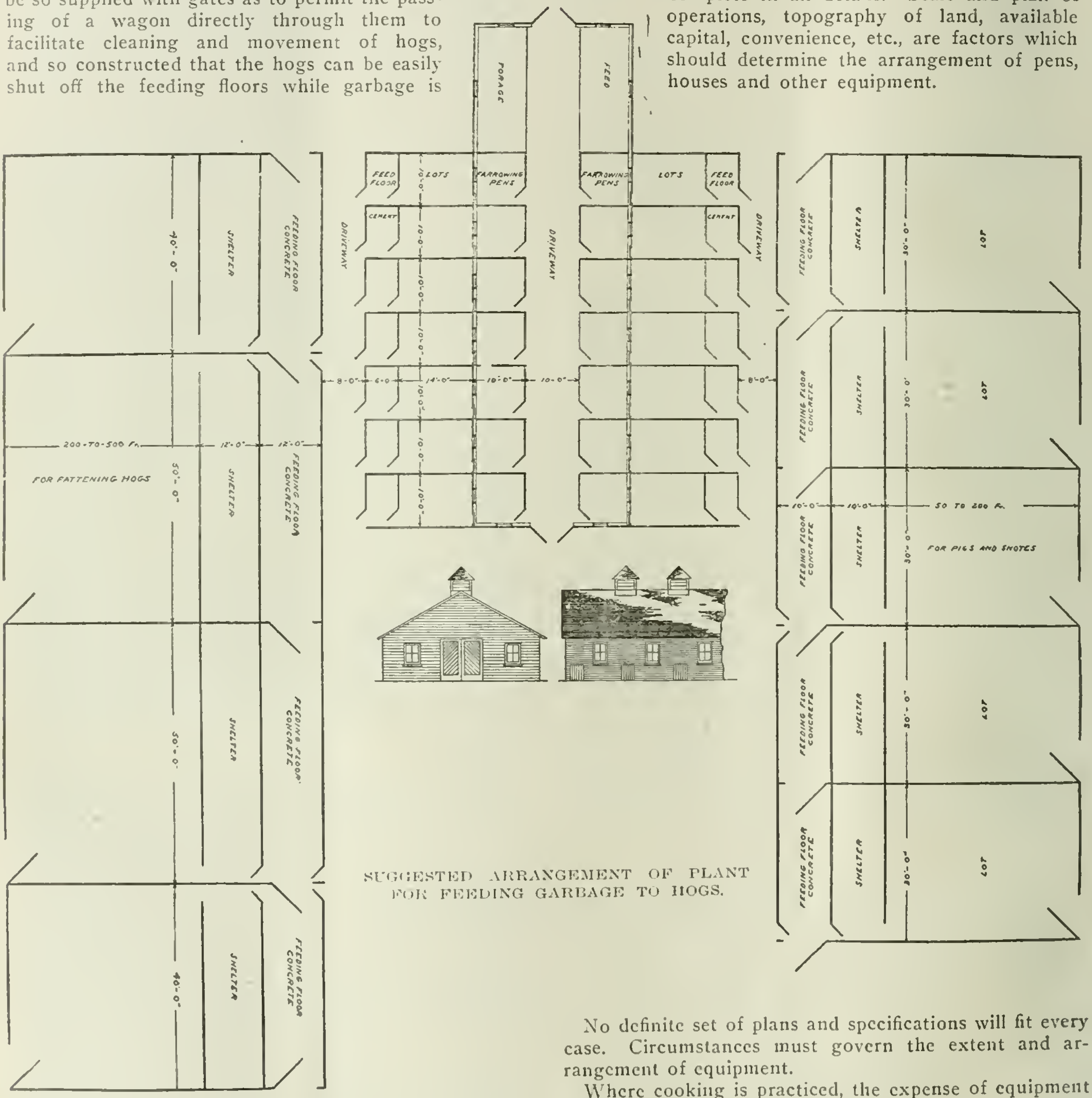
Separate breeding and farrowing quarters should be maintained for sows. A very high mortality among weanling pigs has been noted by eastern feeders. This is probably caused by their digestive systems being less resistant to the effects of cold and damp quarters. The first litters are considered the poorest, while the second and third are somewhat better. How long stock should be retained in the breeding herd depends upon the individual merit of the animals and the personal opinion of the breeder.

EQUIPMENT.

Garbage-feeding enterprises vary widely in equipment and in plan of operation, depending upon the size of the adjacent city, the amount of garbage collected, the number of hogs fed by each individual, local sanitary regulations, and the ideas of different operators. No well-established standard is in use, as regards either equipment or plan of operation.

In the larger and more efficiently arranged plants, the feeding pens are placed side by side, fronting a central driveway, through which the garbage is hauled. That part of the pens adjacent to the drive should be built with a concrete feeding floor upon which the garbage may be thrown. Generally this floor is surrounded with a rim to keep the garbage upon the floor. Some feeders prefer troughs. In either case the concrete flooring is of much assistance in keeping premises properly cleaned and free from rats. Plank flooring may be used, but as it becomes worn the nailheads protrude and cause difficulty in scooping up refuse, cracks appear, boards are broken, and garbage collects under the platform, causing odors, vermin, and disease. In addition, the platform affords an ideal harbor for rats.

The pens should front from 10 to 40 feet, depending upon scale of operations, cost of construction, value of land, and age and character of stock. A greater number of mature hogs than of pigs may be kept together without increasing the danger from disease. The sleeping quarters may be constructed just back of the feeding floor and in this way the refuse garbage and the manure from the hogs may be collected at one operation. Each pen should be supplied with a lot or, if possible, a pasture. This furnishes a place for exercise and in some cases it may be possible to supply the hogs with a crop of rape, soy beans, or some other green forage. The pens should be so supplied with gates as to permit the passing of a wagon directly through them to facilitate cleaning and movement of hogs, and so constructed that the hogs can be easily shut off the feeding floors while garbage is being dumped on and again while floors are being cleaned.



SUGGESTED ARRANGEMENT OF PLANT FOR FEEDING GARBAGE TO HOGS.

In the plan shown, it is sought to arrange gates so that wagons may pass across feeding floors of all but those of farrowing pens in order that the floors and the shelters may be cleaned at the same trip. Also gates are provided to keep animals off floors while garbage is being unloaded, and also during the cleaning process. The pens for fattening hogs and young stock are of various sizes, because it has been found practicable to keep fattening hogs and brood sows in larger numbers than are safe in the case of young stock.

The farrowing pens and lots are arranged between the lots for other stock. For a large establishment this plan is very convenient, but if hogs are purchased and fattened and no stock raised, the central building can be omitted and the fattening pens built on each side of a central drive. The farrowing pens can be built at any convenient place about the premises.

The plan is not intended to fit every case, neither is it complete in all details. Scale and plan of operations, topography of land, available capital, convenience, etc., are factors which should determine the arrangement of pens, houses and other equipment.

No definite set of plans and specifications will fit every case. Circumstances must govern the extent and arrangement of equipment.

Where cooking is practiced, the expense of equipment and operation is increased considerably. In some of the smaller establishments live steam is piped to the bottom of ordinary covered barrels or vats and released. In larger plants, boilers of considerable size are used, and these with the necessary accompanying equipment frequently cost from $400 upward. The total cost of equipment for a garbage feeding plant may vary from a few hundred dollars to ten or fifteen thousand, depending upon methods of construction, materials, and scale of operation.

The WEEK'S NEWS

Lincoln Highway as Military Road—State Highway Developments in Montana, Nebraska and North Carolina—Connecticut's Public Health Nursing Plans—Government Hydroelectric Plant at Muscle Shoals—Rate Increases in Seattle and Indiana and New York Cities—Fires in Lancaster, Tex., and Pittsburgh, Pa.—Federal Control of Municipal Financing—Traffic Regulations of New Jersey Cities Under State Supervision—Educational Campaign for Highway Safety.

ROADS AND PAVEMENTS

Army Officers Confer on Lincoln Highway.

Detroit, Mich.—A conference has just been held here at the national headquarters of the Lincoln Highway Association between the officers of the association and a party representing the Quartermaster's Corps, U. S. A., the Engineering Department, U. S. A., and the Highways Transport Committee of the Council of National Defense. Mr. Raymond Beck, who has been conducting a special investigation of road conditions in the middle west for the Highways Transport Committee of the Council of National Defense, Capt. C. B. Butchers of the Engineering Corps, and Major Uhler of the Quartermaster's Department have comprised the official party investigating road conditions between Chicago and the Atlantic Coast with a view to the ultimate extension of the motor transport plan of the Quartermaster's Department. With the opening of the roads this spring it was apparent that a tremendous volume of freight would be moved over the important main highways of the east and middle west. A day was spent by the army officers and Mr. Beck in going over conditions on the Lincoln Highway as they now exist in Illinois, Indiana and Ohio. A report of the results of their investigation will be made to the Highways Transport Committee of the Council of National Defense. In November of 1917 a letter was sent from the Council of National Defense to the various states through which the Lincoln Highway passes urging the immediate improvement and constant maintenance of that road for possible truck transport service. Many of the states have taken prompt action to bring about needed repairs and improvements and the official party mentioned has been checking over conditions on the Lincoln Highway and will extend their investigations possibly as far as the Mississippi river.

According to a statement by president F. A. Seiberling of the association "the government, through the Council of National Defense, has urged in every state the rapid improvement of the Lincoln Highway. The effect of local political conditions and the inevitable local selfishness, which in normal times has controlled and hampered proper road improvement in every section of the country, will this year, in view of the obvious national necessity for the concentration of effort and funds upon our truly national roads, be eliminated."

To Begin Work on Montana Highways.

Helena, Mont.—Field equipment has been ordered by the state highway commission for the survey parties that will shortly be placed in the field to make the final surveys on twelve projects that have been definitely approved by the commission. The aggregate mileage of these projects is 142.75 and their cost $317,304. Meantime, the preliminary details are being worked out on eighteen other projects and it is expected that by the time the first twelve are ready for construction in the spring, surveys can be completed on the remainder. Some of these projects involve new construction or relocation, but the majority contemplate surfacing, installation of drainage and some grading. If the commission had only automobile traffic under consideration in its road program, short grades as high as 12 per cent would be permissible, but as it is giving its endorsement only to projects that are primarily used for farm traffic, it is desirable to keep all grades below 8 per cent. There are grades said to be as high as 20 per cent on some of the well traveled roads of Montana. Because of the prohibitive cost of transporting surfacing materials long distances, the commission will utilize the best available material in the locality of the project. It is now making a study of the surfacing materials that are to be found in various parts of the state. Gravel will be used where possible; in eastern Montana scoria will be utilized, and in some instances it will be necessary to use a mixture of sand and gumbo. A federal highway engineer will shortly inspect these twelve projects in person, and after they have received his approval the reconnaissance maps and the preliminary statements outlining the projects go to Washington for approval. Then the final surveys will be started. Montana was recently transferred from the Denver to the Portland federal district, in charge of L. I. Hewes. It is possible that along with these twelve projects there will be submitted for federal approval a $25,000 project in Rosebud, a $10,000 project in Big Horn, and an $80,000 project in Yellowstone county.

Contractor Wins Against Detractor of Job.

Chicago, Ill.—John A. McGarry & Co., paving contractors, has won a judgment for $2,500 against C. B. Harter. The suit grew out of statements made by Harter, who is secretary of the Wakeford Improvement club, at a meeting of the Chicago Lawn Improvement club, in which he charged that McGarry had installed bad pavement which did not meet specifications on certain streets. The case was aired back in June, 1915, when Harter and others undertook to prevent the local improvement board from approving the $100,000 paving bill submitted by the McGarry company. Harter at that time charged that McGarry had violated practically every clause of the specifications.

Not to Use Convicts on Road Work.

Lincoln, Neb.—The state board of control, through a communication prepared by Judge Holcomb, member of the board, announces that it will not at this time submit any proposition to county authorities with the view of using inmates of the state penitentiary to work on public highways. The board, after deliberation, finds itself unable to discover any plan which it deems would be practical as contemplated by action of the last legislature. It does not believe, with the conditions surrounding the state, the use of convicts in road making, and especially in improvement of the dirt roads, can be brought about successfully. It, however, believes that if the convicts could be used in some line which would make the penitentiary self-sustaining, it should be done.

Good Attendance at Road Institute.

Chapel Hill, N. C.—The fifth road institute recently held at the University of North Carolina was one of the most successful yet held, both from the standpoint of large attendance and interest in the meeting. There were in attendance at the institute 122 road officials from forty-nine counties. J. S. Bailey, of the Portland Cement Association, lectured on "Late Developments in Concrete Construction." The lecture was illustrated by lantern slides, showing the method of construction of concrete roads. The next meeting opened with a talk by Prof. T. F. Hickerson of the civil engineering department of the university and member of the state highway commission. He discussed "Some War Problems in Comparison With Road Work." Ira B. Mullins, testing engineer of the state highway commission, gave the results of a long study of the efficiency of sand-clay materials. D. H. Winslow, engineer in charge of maintenance for the state highway commission, talked on

"Road Maintenance under the New State Maintenance Law." H. K. Bishop, district engineer for the U. S. Office of Public Roads and Rural Engineering, spoke at length on the federal road act.

SEWERAGE AND SANITATION

Disease Prevention Ordinance Follows U. S. Request.

Denver, Colo.—The recommendations of the U. S. Public Health Service regarding the protection of soldiers and sailors from venereal disease have resulted in the passage of an ordinance designed to enable the officers of the city to exercise stringent and effective control of possible sources of infection. Patients, doctors, hospitals and druggists must notify the Manager of Health and Charity of any case coming to their attention within 48 hours, giving correct details. All reports made to the manager shall be his confidential record and shall not be open to public inspection. The penalty for violation is $300 or ninety days' imprisonment, or both.

Helping the Doctors Report Births.

Columbus, O.—To insure the accurate collection and prompt forwarding of data for birth certificates, Dr. J. E. Monger, state registrar of vital statistics, has recently prepared a pocket-size book for the recording of this information. A copy of this will be given to any physician upon application to his local registrar of vital statistics. Local registrars are supplied from the state registrar's office.

Public Health Nursing in Connecticut.

Hartford, Conn.—The general need of more public health nurses in this State has been recognized by the state department of health for some time, and it has also been known that public health nursing service was an urgent necessity in certain localities. A recent survey by Miss Helen Boyd has placed in the hands of the department information and data of great value. Miss Boyd was sent to this state by the nursing committee of the General Medical Board of the Council of National Defense at the request of this department. The report says:

> "More important than the care of the sick, necessary as it is, is the preventive work that the public health nurse can do.
>
> "The visiting nurse associations do not report an abnormal increase in their work this year—that the over-crowding and the high cost of living has not induced acute illness needing the visiting nurse, does not mean that people's resistance is not being steadily reduced. It is against the insidious working of these conditions that the nurse can make headway by teaching the people in their homes how to live and what to eat.
>
> "The tuberculosis problem in the state is well cared for when compared with other states. That sanataria are provided with more beds per population than other states does not mean, however, that there is not a great deal of follow-up work which should be done. The patient, before he goes to the sanatorium and after he comes back is sadly neglected in the greater part of the state.
>
> "The result of keeping the children safely at school is one great feature of school nursing. Another is prevention of epidemics. A school nurse early learns to note suspicious symptoms and can immediately send a child to the school physician for diagnosis. . . . A large population of foreigners whose standard of living is such that every means in our power should be used to teach them hygienic living.
>
> "There are ninety-nine nurses doing industrial nursing in the state of whom eleven are not graduate nurses. The work of a nurse in a factory is altogether too responsible for an undergraduate.
>
> "That the State of Connecticut is ready to develop public health nursing cannot be doubted. In the twenty-three towns visited, nine had definite groups who were interested. In three, the money had already been raised to support a nurse. Thirteen already had nurses. One of the thirteen was just starting a second welfare station. Only one town was apathetic. A public health nurse under the State Commissioner of Health would be of invaluable service in encouraging, directing and helping these communities who are so anxious to go ahead with public health nursing, but have so little knowledge of the subject. This expert advice could easily be given to them by a state supervisor of Public Health Nursing."

The public health nurses in Connecticut are classified as follows: General visiting nurses, 107; infant welfare nurses, 15; tuberculosis nurses, 14; school nurses, 50; industrial nurses, 99; total, 285. There are forty-two towns with public health nurses and 126 towns without any such service. This large number of towns without public health nursing service in itself shows the need of many additional public health nurses. The report has carefully estimated that 233 additional nurses are necessary to properly equip the state.

WATER SUPPLY

City Need Not Pay For Fountain Water.

Columbus, O.—Claims by the bureau of supervision of public offices, department of auditor of state, that cities must pay for water furnished in street troughs and fountains by municipal water works, are wrong, according to an opinion by the attorney general's office. He says the council may order such water furnished free, just as it is furnished in public buildings. The ruling affects practically every city in Ohio having municipal water works.

Electric Company Contracts to Thaw Water Pipes.

Sandusky, O.—The city and the Sandusky Gas & Electric Company have signed a contract whereby the company is to be paid $15 per service for thawing out frozen water pipes up to and including 1½ in. in diameter. For each ½ in. increase in size of pipe above 1½ in. $1 additional is charged. This price covers the customary work of the company. Where an extension of more than 200 ft. is required $1 extra is charged for each additional 100 ft. of service extension. In addition, the city furnishes the necessary vehicle to convey the equipment from place to place and an experienced waterworks man to look after the water piping. The city makes all arrangements with the customer and makes collections, and the company bills the city each month for the service rendered. The average time required to thaw out an ordinary service after the current is applied is about eleven minutes. This does not mean a substantial profit to the company, but a considerable saving to the city, for were it not for this system being employed, in many instances it would become necessary to take up the pavement in the streets in order to thaw out the frozen pipes by other methods.

Commission Declares Company's Rates Unreasonable.

Guilford, Me.—The state public utilities commission has decreed that the schedule of rates of the Guildford Water company filed with the commission and which was suspended until February is unreasonable, unjust and unduly and unlawfully discriminatory and is not permitted to go into effect. The company is ordered to refrain from charging rates in excess of those in effect by the company upon and immediately prior to August 29, 1917. The Guilford Water company is forbidden to charge its customers until after April 1, 1918, any other or different rates than those in the present schedule. The company must file with the commission, on or before March 20, 1918, a new schedule of rates effective April 1, 1918. If prior to the filing of schedule the town of Guilford must modify its existing contract with the company so as to provide for an additional payment to the company of $300, then the rate to be charged to first faucet customers for service, the minimum rate to be charged for any single service and the rate to be charged to stores and business places not requiring more than ordinary supply of water, shall be $7. If, however, prior to the time indicated for the filing of the new schedule the town of Guilford shall not have so modified this contract, then the rate to be charged to the above-named takers and shown in the schedule shall be $7.50. Last August the company filed in the office of the commission, to become effective on and after October 1, 1917, a change in its existing rates for service. The rate for the first faucet, which had been $6, was to be increased to $8 per year; the rate to stores and business places was to be increased from $6 to $8, and the rate of $200 charged to the Bangor & Aroostook railroad was to be increased to $250. This latter increase is understood to have been brought about by an agreement between the two companies. While the amendment to the schedule which would bring about these increases was properly filed with the commission on August 29, and while such filing constituted all the notice of the change which the company was by law obliged to give, nevertheless the inhabitants of Guilford did not receive any actual notice of the proposed change until the very last part of September. Upon obtaining the information the board of selectmen requested the public utilities commission to suspend the tariff pending an investigation.

STREET LIGHTING AND POWER

Government to Construct Big Hydroelectric Plant.

Washington, D. C.—President Wilson has signed the order authorizing the construction of the first and largest of the dams on the Tennessee River proposed a few years ago as the Muscle Shoals hydroelectric development. The plans are to be worked out with funds derived from the appropriation for a government nitrate plant which was made by Congress in 1916, and the hydroelectric plant when completed will become a part of the two nitrate plants now being built near Muscle Shoals at Sheffield, Ala. These two plants are a factory for the fixation of nitrogen which will produce approximately 20,000 tons of ammonium nitrate a year and will be owned and operated by the United States and a plant owned by the United States but operated by the Air Nitrates Corporation, which will produce 110,000 tons of ammonium nitrate a year.

Big Raise in Seattle Gas Rates.

Seattle, Wash.—An order increasing the gas rates for the city of Seattle approximately 25 per cent has heen issued by the public service commission at Olympia. The new schedule granted to the company is higher than the proposed scale of increases asked by the company several months ago when it filed its schedule with the commission. The committee abolished the readiness-to-serve charge, but increased the minimum from 25 cents to 60 cents. The new rates will increase the revenue of the Seattle Lighting company $290,000.

Proposed Utility Company Must Have Proper Capital.

Groton, N. Y.—The state public service commission for the second district recently handed down a decision on the request by the Groton Electric Power Corporation for permission to construct a plant to serve Groton and nearby communities. The commission ruled as follows: "An electric company applied for permission to construct and for approval of franchises in certain villages and towns where there is a decided need for electric service. The company was not yet fully organized as a corporation. It had filed its certificates, but had obtained no authorization for capital stock from this commission. In the circumstances it was held that the application should be granted, but that no construction should be undertaken until proper captial authorization from the commission should be secured."

New Gas and Electric Rates.

Middletown, N. Y.—The Public Service Corporation of Port Jervis and Middletown has now in effect the following new rates for electric light and power and gas in this city: Gas—$1.25 for each 1,000 cubic feet up to 20,000; for the next 10,000 up to and including 30,000 cubic feet, 75 cents per thousand feet. Electric light and power—10 cents per kilowatt hour net; if in a month the amount used exceeds $25, 10 per cent discount; over $50, 20 per cent discount.

Three Cities to Pay More for Gas.

Kendallville, Ind.—The Indiana public service commission has entered an order, as a war emergency measure, authorizing the Indiana Fuel and Light Company, which operates plants at Kendallville, Garrett and Auburn, to increase its schedules of gas rates during a period not to exceed two years. There were no protests from any of the cities represented in the petition, but the commission did not grant in full the company's petition, which asked for a permanent increase in gas rates. A net increase of 25 cents a thousand cubic feet was granted, bringing the new price to $1.50 gross and $1.40 net, while it had been $1.25 gross and $1.15 net before. The commission's order pointed out that the new rates may be changed at any time. The commission's engineers found the reconstruction value of the company's property to be $400,583, and the present value to be $366,537, including working supplies and working capital. The company asked that $3,791 be included in the appraisal for salaries and commission on promoting business, but the commission cut this figure down to $1,500 and made corresponding reductions in other similar demands made by the company. The commission allowed 2 per cent, as a depreciation charge, and some members of the body felt, it is known, that this depreciation charge—which would estimate the life of the company's property at fifty years—was too low. Allowing the company 7 per cent return on its capital stock, over and above operating expenses and overhead charges, the valuation fixed would mean that for every 1,000 feet of gas sold under the old rates the company would lose 28 cents. To allow for part of this difference an increase of rates totaling 25 cents was permitted. All these figures refer to the primary rate for gas, or that charged to the smallest consumers. Corresponding figures for the other classes of consumers are set out in the commission's order.

FIRE AND POLICE

Fire Captain Killed in Collision.

Cumberland, Md.—George W. Miller, captain of Central fire station, was so severely injured when pinned between the department's auto fire engine and the police patrol that he died later at the hospital. The fire engine, followed by the patrol, was responding to an alarm. The engine had just stopped at the scene of the fire and captain Miller and James Finan leaped from the steps of the engine with the fire hose. The patrol, driven by William Cubbage, could not be stopped in time and captain Miller was struck by the fender of the patrol and pinned against the engine. His leg was crushed below the knee and was amputated. Immediately after the operation his condition was reported as satisfactory, but a few hours later he died. Fireman Finan, by quick action, saved himself from serious injury when he leaped back upon the steps of the engine. He was bruised and cut by the glass from the patrol's windshield which was broken by the fire ladders. According to chief of police Eyerman, the street was very dusty and the patrol was enveloped in a cloud of dust which prevented the driver from seeing that the engine had stopped. Captain Miller joined the city fire department in August, 1907, and had been in continuous service since. He was 52 years old.

Fire Destroys Four Business Blocks.

Lancaster, Tex.—Fire recently swept the business section of Lancaster, destroying all the buildings on four blocks in the heart of the town with a loss estimated at approximately $300,000. The flames were fanned by a strong wind from the northwest. Fire engine companies were sent from Dallas, Waxahachie and Ferris and the fire was under control only after four brick buildings, seven frame buildings, an elevator, a church, a hotel and six dwellings were destroyed. No lives were lost. The fire is thought to have originated from the burning of a pile of rubbish near a barber shop. In fifteen minutes hope of saving the group of frame buildings, of which the barber shop was one, was abandoned. A high wind blowing from the northwest carried burning embers from the barber shop across the street setting fire to a building there. The fire department was hindered in its work by a low pressure of water. Engine company No. 10 was sent from Dallas and firemen and engines were sent also from Waxahachie and Ferris. Schools were dismissed, business houses were closed, and the entire male population volunteered to aid in the work of fighting the fire while women and children carried household goods from residences which were threatened. Piles of merchandise of every description littered the square. Yards in the residence district south and east of the burning buildings were stacked with household effects. People living in houses which were in the path of the flames hurried to remove their belongings and many dwellings which did not burn were emptied of household goods. Telephone and telegraph wires were put out of commission and the city was cut off from communication with outside points for more than two hours. Firemen strove valiantly against terrific odds to stop the spread of the flames, which threatened to wipe out the entire eastern and southern sections of the town. Bucket brigades, composed of men and boys, were formed to throw water carried from nearby wells upon the roofs and sides of houses as a protection against sparks and flying embers. Scores worked throughout the afternoon in this way and prevented the spreading of the fire to other residence sections. The flames gained headway with such amazing rapidity that persons caught in stores found it impossible to leave by front entrances and were compelled to flee through rear doors. Members of the Lancaster fire department asserted that the current which supplied the pumps was shut off three times because of live wire dangers, leaving the department without means to combat the blaze. Officials of the Texas Light and Power Company said that the power was not shut off until engines from surrounding towns reached the scene. Early in the day water supply for drinking and domestic purposes was shut off to facilitate the installation of an overhead storage tank. The business district of Lancaster was practically without drinking water during the fire. At night the city was in darkness, as the service of the power company was badly crippled.

Police Force Strikes—Is Fired.

Wilkinsburg, Pa.—When the police force went on strike here, chief Don Snyder dismissed the whole force. Some of the strikers called up the chief and offered to assist him should he need them. They made it plain, however, that they would act as private citizens and not as policemen. The strikers declared that burgess John Miles was entirely responsible for the trouble in the department and that they would under no condition submit to the present conditions. Burgess Miles had been invited to attend a meeting but he failed to appear. The invitation was extended to burgess Miles "to come before this meeting and justify himself in the position he has taken in the cutting down of the police force by two men and of the discharging of certain cases that have been brought before him for trial with absolute evidence there to convict and for even refusing to hear this same evidence." The whole situation, said the men, has arisen from the refusal of the burgess to support the police department in any instance in the performance of its duty.

Centralizing Fire Alarm System.

Cranston, R. I.—Steps have been taken in a plan for centralizing the fire alarm system of the city of Cranston ultimately into a city-owned and city-controlled system. The city property committee decided to place the battery operating the Auburn system at the city hall. This will join up systems covering more than half the territory of the city to a central station. While it does not actually make the city the owner of the systems, it virtually places them in the city's hands. The future may see the addition of the Edgewood and Pawtuxet systems to the central scheme now to be put into operation. There have been some peculiar features about the development of fire alarm systems in Cranston. The beginning has been made in each section by the local fire company, and in pursuance of this plan the location of boxes has followed in Edgewood, Pawtuxet, Auburn, Knightsville, Cranston Print Works and Arlington. The Edgewood, Pawtuxet and Auburn systems have been entirely separate, while the Pocasset system, the first on the westerly side of the city, received the addition of the Print Works and, afterward, of the Arlington boxes. There have been four separate battery stations, with as many superintendents, these being located at Pawtuxet, Edgewood, Auburn and Knightsville. In point of territory covered, the Knightsville, or Pocasset, system was the largest. Each system except the Auburn started with a bluestone gravity battery system, the Auburn system being the first to be equipped with the more modern storage battery. In the original scheme the fire alarm boxes and inside equipment were bought by the companies with their own funds, augmented by popular subscription, while the town of Cranston, and, afterward, the city, was asked to do the outside wiring. In this way the city was part owner of all the systems, although it did not, and does not yet, own the apparatus. In its beginning this arrangement worked fairly well. The fire companies followed the old custom of asking the city for supplies for fire alarm maintenance, receiving it in the same way that they have for years received periodical, although not regular, grants of apparatus of other kinds. The spreading out of the system, however, led to different complications, each with its reflection of neighborhood patriotism and occasionally of neighborhood feeling. The suggestion that the fire alarm systems should be centralized under city control has been made for some years, in line with the general proposal that the city should take over the entire fire-fighting service. Many difficulties arose, however. When an application was made that the city furnish a new set of cells for the Auburn fire alarm battery, to replace the set which had been in use for some years, council decided that the battery be added as a unit to the battery already operating the Knightsville and Arlington systems, the additional power being sufficient to handle the entire number of circuits.

Prevents Conflagration in Theatre Section.

Pittsburgh, Pa.—One of the hardest fires in the city in a long time was brought under control after three hours of difficult fighting. Originating in a small printing establishment, a series of rapid fire explosions of small vats of chemicals razed partition after partition, floor after floor, until four blazing stories of the building, surrounded by valuable property on every side, threatened the entire block with destruction. For a time it looked as if the theatre section would be the scene of a conflagration. Within ten minutes after all the downtown companies were in action, together with trucks from upper Fifth avenue and the Northside, first alarm totalling fifteen. As company after company came to the scene and the flames apparently were sweeping uncontrolled, theatre audiences of four different houses became alarmed, but were calmed by announcements from the stages that the theatre zone was isolated by a wall of water. A little force was needed when several families in Scotts way, which was endangered for a while, refused to vacate their homes. A number of firms suffered considerable loss. Dominick Newmyer, a fireman of Company 33, was overcome by fumes on the seventh floor of a building adjoining, from which a barrage of water was being maintained, and taken to the hospital. The fire, in the center of a group of buildings, was extremely difficult to locate and then to attack. Every building and structure surrounding the flames was strung with hose.

GOVERNMENT AND FINANCE

Federal Committee to Pass on Bond Issue.

Washington, D. C.—Every municipal bond issue of $100,000 or more hereafter will be passed on by the Federal Reserve Board's capital issues committee before being floated. By reducing from the proposed $250,000 limit to $100,000 the minimum size of municipal issues which it will consider, the committee extended its influence over several times more municipal bond issues than heretofore. The committee found recently, after analyzing pending applications for approval of proposed issues, that the great bulk of municipal bonds was offered in blocks of less than $250,000 and therefore were not subject to the committee's restrictive influences. Federal reserve agents of the twelve reserve banks, who also act as chairmen of the subcommittees of the capital issues body in their respective districts, were recently in Washington for a conference and the general operation of the new voluntary system of regulation of security issues was discussed. In a circular of instructions to applicants for the committee's approval of contemplated issues, the committee and its advisory board, headed by Allen B. Forbes, explained that the purposes and circumstances surrounding each issue must be described in full in the application. This is particularly necessary if funds are needed for extension of improvements relating directly to war production or for fulfilment of any national, state or local governmental requirement. "In all cases," said the instructions, "full reasons should be given why the proposed issues cannot be postponed until after the war or why the necessity is greater than the paramount need of the National Government in conserving the financial resources, materials and labor of the country for the war." Details concerning capitalization and financial condition of a company are required in connection with applications for issuance of stock. For state, county or municipal issues, the committee requires a copy of the bill, resolution or ordinance under which they were authorized. The committee announced that it is working with the federal office of public roads in determining what contemplated road construction this year is necessary for urgent military or economic reasons. Most roads to which the bureau heretofore has planned to contribute will be built even under the capital issues restrictions, it is said, since they have been carefully selected on the basis of their economic importance. The support of state highway commissioners was enlisted at a recent conference with the capital issues committee and they will report soon to the public roads bureau an outline of their respective curtailed road-building program for the year.

Raise Pay of All Employees.

Dubuque, Ia.—Besides raising the pay of policemen and firemen, council has increased the wages of the city laborers, including the sewer gang, the sewer inspector and the ward foremen. The laborers now receive $2.50 for a nine-hour day, or 28 cents an hour for less than a day; the sewer inspector will receive $85.00 per month instead of $75.00 and the ward foremen will receive $75.00 per month instead of $65.00. Council also decided to increase the salaries of the other city officials, except the mayor and aldermen, ten per cent. The city carpenter was raised from $55.00 to $65.00 and the janitor from $55.00 to $65.00. It was also voted to raise the price paid for macadam broken by hand labor from $1.00 to $1.25 per cubic yard when quarried and from 75 cents to $1.00 per yard when broken in the open.

New City Manager.

Brownsville, Tex.—The board of city commissioners has announced the appointment of W. E. Anderson, an engineer at Dallas, Texas, to be city manager of Brownsville. He has assumed his duties. Anderson has been prominent in engineering circles in Texas during the last twenty years. He succeeds F. H. Williams, resigned.

City Wins in Bond Sale Suit.

Rome, Ga.—A decision handed down by the Georgia supreme court in the case of Breed, Elliott and Harrison, a Cincinnati bond-buying firm, against the city of Rome ends a suit started about two years ago. The Cincinnati firm wanted to buy the $50,000 of bonds issued by the city shortly before April, 1914, to secure funds for building the auditorium, and the bid was accompanied, as required by the city, by a certified check for $500. The firm secured the bonds, its bid having been the highest, but refused to accept them because they had been issued by the mayor and council that governed this city at the time and were signed by the mayor. The commission form of government assumed control of the city on April 1st of that year, and the Cincinnati firm wanted the bonds reissued and signed by the commission. This the city attorney held was unnecessary, and the refusal to accept the bonds sold to them, by the Cincinnati firm, was followed by the city taking their $500 check to pay the expense of readvertising and reselling the bonds, as it was considered to have been put up as a forfeit. The firm then brought suit against the city for the recovery of this check, and also brought suit for $1,300, which it claimed would have been their commission had it secured and sold the bonds. Judge Wright, at the hearing of the cases here, decided that the $1,300 could not be recovered, and his decision was upheld by the supreme court. He also decided that the bond buyers should have their $500 check returned to them, and from this decision the city, through the city attorney, appealed to the supreme court, which has not yet decided this phase of the matter.

TRAFFIC AND TRANSPORTATION

State Commissioner Must Approve Local Traffic Rules.

Trenton, N. J.—That approval of any local traffic ordinance by the state commissioner of motor vehicles is necessary before it becomes effective is the substance of an opinion handed down in the supreme court by justice Black setting aside the conviction of John A. Eveler under an ordinance of Atlantic City prohibiting the parking of cars within a certain distance of the boardwalk for longer periods than are required to load or unload them. Justice Black remarked that under the state traffic act of 1915 such ordinances are without effect unless approved by the commissioner of motor vehicles. He added: "The statute is clear. There is no room for construction. It is founded in a wise public policy, namely, to promote a uniformity of regulating traffic throughout the state. It should be observed and not evaded by the local authorities."

Proposes Street Viaduct to Relieve Traffic.

New York, N. Y.—Dr. John A. Harriss, deputy police commissioner in charge of the traffic, announced that he is working on a plan to relieve traffic conditions by having constructed an elevated roadway for automobiles and persons on foot along Sixth avenue paralleling the present elevated structure between Bryant Park at Forty-second street and Fifty-ninth street in Central Park. "A roadway would be built on either side of the elevated tracks," said commissioner Harriss, "on the same level with the elevated structure now in operation and between the tracks and the buildings. The roadway east of the tracks would be used for northbound traffic and the west roadway for southbound vehicles. The roadways would be used for through traffic only, the entrances and exits being at Fortieth street and at Central Park. The object of this roadway would be to relieve Fifth avenue, Broadway, and other streets by providing a much quicker way north and south and particularly to relieve the very serious congestion at Forty-second street."

"Movies" to Teach Highway Safety.

New York, N. Y.—Automobile and moving picture men have combined to support a vigorous safety-first campaign designed to reach not only the pedestrians and motorists of New York but of the entire nation. Francis M. Hugo, secretary of state of New York, recently described the plans of the whole campaign for safety. He said that with 1,200 deaths due to automobiles last year there was going to be drastic action taken by state legislatures if the educational propaganda failed. The plans, as Mr. Hugo announced them, are for a safety-first motion picture to be shown from one end of the United States to the other. Such a picture already has been made by a leading film company. "In 1901," said Secretary Hugo, "the first license was issued in New York for motor vehicle operation. Last year we licensed 138,000 chauffeurs and we expect to pass the 150,000 mark. To supervise this number I have six inspectors. I am able to announce for the first time, however, that an arrangement has been made with the state department of education and the state constabulary whereby every child in the state will be taught the rules of the road. It is as important for him to know how to cross the street nowadays as it is for him to know his a-b-c's." Mr. Hugo said that he was determined to drive the intoxicated chauffeur and the unlicensed driver from the highways of the state. He urged the passage of two bills now pending in the legislature, one providing that operators of motor vehicles be required to obtain a license to drive anywhere in the state (there is such a law now applicable only to New York city), and the other creating an authority in the secretary of state to supervise and pass upon headlight dimmers.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Bituminous.

Worcester Asphalt Mixing Plant. Data on operation of municipal plant. By Albert T. Rhodes, Commr. of Street Work. 1 ill., 1,400 words. Municipal Engineering. February. 30 cts.

Rhode Island Practice in Construction of Bituminous Macadam. Paper before Providence Engineering Society. By I. W. Patterson, chief engineer, State Board of Public Roads. 3,600 words. Engineering & Contracting. Feb. 6. 15 cts.

New Features in the Design and Construction of Bituminous Roads and Treatments and Cement Concrete Roads and Pavements. Paper before American Road Builders' Assn. By Chas. N. Upham, chief engineer, Delaware Hwy. Comm. 4 ills., 4,300 words. Good Roads. Feb. 16. 15 cts.

Repairing Bituminous Pavements. Causes of defects and methods of treating each. 2,200 words. Municipal Journal. Feb. 2. 10 cts.

Bituminous Roads, Mixed and Penetration Methods. General discussion of advantages and methods. 3 ills., 2,000 words. Better Roads & Streets. February. 20 cts.

Relative Efficiency of Methods of Repairing Bituminous Macadam and Bituminous Concrete Pavements. Paper before American Assn. for Advancement of Science. By Geo. H. Biles. 3,800 words. Engineering & Contracting. Feb. 6. 15 cts.

Brick.

Failure of Brick Pavement. Caused by careless construction. By Harlin H. Edwards. 2 ills., 1,500 words. Municipal Engineering. February. 30 cts.

Rattler Tests for 3-in. Paving Brick. Allowing for small size in rattler loss. Paper by Wm. C. Perkins. 1,800 words. Engineering & Contracting. Feb. 6. 15 cts.

Brick Pavements Being Adapted to Country Roads. Abstract of paper by Cliford Older before American Road Builders' Assn. 800 words. Engineering News-Record. Feb. 28. 20 cts.

Rattler Tests for Paving Brick of Various Depths. Paper before American Assn. for the Advancement of Science. By Wm. C. Perkins. 3,000 words. Better Roads & Streets. February. 20 cts.

Concrete.

Methods of Repairing Concrete Roads. Experiences in Michigan. By Frank F. Rogers, State Hwy. Commr. 600 words. Engineering & Contracting. Feb. 6. 15 cts.

Cold-Weather Construction of Concrete Roads. Suggestions made by Prof. Duff A. Abrams. 700 words. Municipal Journal. Feb. 2. 10 cts.

First Frost is Never Responsible for Cracked Concrete Roadways. Damage can be traced to the freezing which follows a thaw. Water-logged soil confined between solidly frozen earth and new layer of ice expands and cracks slabs. By J. L. Harrison. 2 ills., 2,200 words. Engineering News-Record. Feb. 28. 20 cts.

Granite Blocks.

Approved Practice in Construction of Granite Block Pavements. Paper before American Assn. for the Advancement of Science. By Clarence D. Pollock. 4 ills., 2,000 words. Municipal Engineering. February. 30 cts.

Wood Block.

Wood-Block Pavement Failures of Southern Cities Analyzed. Abstract of paper by C. H. Teesdale before American Wood Preservers' Assn. Complete data from 62 pavements in 13 Southern cities. 2 ills, 3½ pages. Engineering News-Record. Feb. 14. 20 cts.

Construction.

State Highway Construction in California Under Commission Supervision. Discussion before League of California Municipalities. 1,000 words. Pacific Municipalities. February. 30 cts.

Road Construction in Oklahoma. Review of work done during 1917, and funds provided for 1918. By T. F. Hensley, publicity mgr., Dept. of Hwys. 2,500 words. Better Roads & Streets. February. 20 cts.

Construction and Maintenance of Highways Under War Conditions. Paper before American Assn. for the Advancement of Science. By Arthur H. Blanchard. 2,200 words. Better Roads & Streets. February. 20 cts.

Maintenance.

State Maintenance System for North Carolina. Brief discussion of system employed. By B. H. Winslow, state maintenance engineer. 1 ill., 800 words. Better Roads & Streets. February. 20 cts.

Street Repairs in Columbus, O. Study of experience in mantaining various classes of pavements during several years past. By Chas. C. Brown. 2,400 words. Municipal Journal. Feb. 2. 10 cts.

New Features in the Maintenance, Reconstruction and Repair of Earth, Sand-Clay, Gravel, Water-Bound Macadam and Bituminous Roads, Penetration Method. Paper before the American Road Builders' Assn., by Alexander W. Graham, Chf. Hwy. Engr of Missouri. 2,700 words. Good Roads. Feb. 23. 15 cts.

The North Carolina State System of Road Maintenance. Forms used by supervisors and others in reporting and recording information. 1 ill., 2 pages. Engineering & Contracting. Feb. 6. 15 cts.

Grades.

Establishment of Grades. From the legal point of view. By D. J. Hall, city attorney of Richmond. 1,000 words. Pacific Municipalities. February. 30 cts.

Road Grades, Widths and Thickness and Crown of Surfacing. General conclusions of Am. Soc. C. E. Committee on Road and Materials. 2,400 words. Engineering & Contracting. Feb. 6. 15 cts.

Drainage.

Road Drainage. Paper before Indiana Road School by J. L. Harrison. 3,200 words. The Canadian Engineer. Feb. 21. 15 cts.

Traffic.

Makes $35,000 Traffic Census in Chicago Loop. Maximum hourly record 1,142 vehicles. Double-deck street will separate fast and slow traffic. Automobiles are used mainly for business. 1 ill., 3,300 words. Engineering News-Record. Feb. 7. 20 cts.

The Highway; Its Relation to Transportation. Paper before the American Road Builders' Assn. by S. M. Williams. 3,500 words. Good Roads. Feb. 16. 15 cts.

Laws.

Highway Legislation in Virginia. Changes suggested to provide more efficient road transportation. By Geo. P. Coleman, State Hwy. Commr. 2,100 words. Good Roads. Feb. 9. 15 cts.

Traffic Laws in Relation to Highway Construction and Maintenance. Paper before American Road Builders' Assn. By W. A. McLean, Deputy Minister of Highways, Ontario. 3,000 words. Good Roads. Feb. 16. 15 cts.

Financial.

Cost-Keeping and Construction Accounting. Address before Northwestern Society of Highway Enginers. By G. Ed. Ross, Auditor, Oregon State Hwy. Dept. 3,800 words. The Canadian Engineer. Feb. 21. 15 cts.

Financial Burden of the State Highways. Discussion of how costs should be divided. By Chas. F. Stern. 3,000 words. Pacific Municipalities. February. 30 cts.

Financing Pavement Construction and Renewals. Based on practices at Utica, N. Y., and other cities. 3,800 words. Engineering & Contracting. Feb. 6. 15 cts.

Keeping Records for Street Work Proceedings. Description of plan used in Daly City, Cal. By Chas. L. Biebel, city clerk. 1 ill. 1,500 words. Pacific Municipalities. February. 30 cts.

Societies.

Convention of American Road Builders' Association. Narrative of the St. Louis Convention. 2,500 words. Municipal Journal. Feb. 16. 10 cts.

Convention of American Road Builders' Association. Description of Fifteenth Annual Convention. 1 ill., 5,500 words. Good Roads. Feb. 9. 15 cts.

Miscellaneous.

Paving Work for 1918. Discussion of present outlook. 700 words. Municipal Journal. Feb. 15. 10 cts.

Paving Work in St. Louis. Review of work done during 1917. Organization of force, itemized costs, and operation of municipal asphalt plant. 4 ills., 3½ pages. Municipal Journal. Feb. 2. 10 cts.

Creation of More Equitable Contract Between Highway Commissions and Contractors. Paper before American Road Builders' Assn. By James C. Travilla. 3,000 words. Good Roads. Feb. 16. 15 cts.

Making Street Openings. Use of compressed air for this purpose in San Francisco. By P. E. Chapman. 1 ill., 800 words. American Gas Engineering Journal. Feb. 16. 15 cts.

St. Louis and Its Streets. General description of streets and kinds of pavement used. By Wm. Holden. 10 ills., 4,000 words. Good Roads. Feb. 2. 15 cts.

Effect of the War on Road Improvement. Contract prices for Federal aid work in Pennsylvania, Ohio, Maryland and Virginia. By H. A. Bishop, Office of Public Roads. 2,200 words. Good Roads. Feb. 2. 15 cts.

Street Paving During 1917. Tables giving summary of pavements laid by about 600 cities, with characters and costs of same; also road materials available in each locality. 16 pages. Municipal Journal. Feb. 16. 10 cts.

Programs for War Roads. Selecting essential roads and best types of pavement. Abstract of paper by Geo. C. Diehl. 2 ills., 2,000 words. Municipal Journal. Feb. 16. 10 cts.

Military Roads of Texas. Outline of what the State Hwy Dept. would like to do. By Geo. A. Duren, State Hwy. Engr. 1 ill., 2,000 words. Better Roads & Streets. February. 20 cts.

Street Paving and Maintenance in Chicago. General discussion of practices and legal procedures. By Felix S. Mitchell, Supt., Bureau of Streets. 5 ills., 4,000 words. The American City. February. 40 cts.

SEWERAGE AND SANITATION.

Designing.

Design and Construction of Vitrified Pipe Sewers. Some practical hints for young engineers. By Chas. E. Collins. 1 ill., 3,500 words. Municipal Engineering. February. 30 cts.

Effect of City Zoning on Sewerage System Design and Cost. Impervious area, volume of sewage, length, depth and cost of sewers, all more or less affected. 1,400 words. Engineering News-Record. Feb. 21. 20 cts.

Construction.

Laying Large Pipes in Tunnel. Contrivance used in Vancouver, B. C. 2 ills., 600 words. Municipal Journal. Feb. 2. 10 cts.

Reconstruction of Queen Street Sewer, Toronto. Wooden separating troughs used; details of diversion chambers. By W. S. Harvey and W. G. Cameron, Engrs. of the Dept. of Sewers. 9 ills., 5,000 words. The Canadian Engineer. Feb. 14. 15 cts.

Sewer Pipe.

Supporting Strength of Sewer Pipe in Trenches. Result of tests by Iowa Engineering Experiment Station. 2,400 words. Engineering & Contracting. Feb. 13. 15 cts.

Service Strength of Sewer Pipe. Theories and experiments by Iowa State College Experiment Station, relative to loads on sewer pipes in trenches. 1 ill., 2½ pages. Municipal Journal. Feb. 23. 10 cts.

Sewer Pipe Joints. Topical discussion before Boston Soc. of Civil Engrs. 2 ills., 8,000 words. Journal of Boston Soc. of Civil Engrs. February. 60 cts.

Manufacture of Sewer Pipe. Process of manufacturing vitrified clay pipe described. By Dr. Frank Coleman. 3,500 words. The Canadian Engineer. Feb. 21. 15 cts.

Sewage Treatment.

Some Operating Results of Pennypack Creek Sewage Treatment Works of Philadelphia. Data from the 1916 report. 1,500 words. Engineering & Contracting. Feb. 13. 15 cts.

Principles of Sewage Disposal. Brief review of the entire subject by T. Aird Murray. 5,000 words. Western Municipal News. February. 15 cts.

Septic Tank Litigation. Plea to resist payment of royalties. 1,000 words. Pacific Municipalities. February. 30 cts.

Operating Problems of Imhoff Tanks. Normal sludge digestion depends on enzyme liquefaction overbalancing bacterial decomposition. Abstract from paper by Geo. W. Fuller before New Jersey Sewage Works Assn. 2,000 words. Engineering News-Record. Feb. 28. 20 cts.

Electro-Chemical Sewage Treating Process. Description of plant operated at Decatur, Ill. By W. S. Shields. 3 ills., 6,000 words. Municipal Engineering. February. 30 cts.

Disposal of Sewage Sludge. Discussion at Annual Meeting of Association of Managers of Sewage Disposal Works, England. 3,000 words. The Surveyor. Dec. 28. 20 cts.

Methods and Costs of Pressing Sewage Sludge. Paper before Am. Soc. of Municipal Improvements. By Kenneth Allen. 5,500 words. Engineering & Contracting. Feb. 13. 15 cts.

Treatment of Sewage by the Activated Sludge Process. Continued from previous issue. Data from the Milwaukee Experiment Plant. 3 ills., 4,500 words. The American City. February. 40 cts.

Recovery of Grease and Fertilizers from Sewage. Massachusetts Joint Investigating Board reports against applying Miles acid process. 4,500 words. Engineering News-Record. Feb. 14. 20 cts.

Sanitation.

Sanitary Work in the Army. Describes methods and appliances used in the British army. By Major Arthur J. Martin. 1,500 words. The Surveyor. Dec. 28. 20 cts.

WATER SUPPLY.

Dams and Reservoirs.

Earth Dam with Screened Gravel Core and Pipe Drains. Pervious interior and drainage system prevent saturation. Dam has steel movable crest, concrete spillway and outlet culvert with gate tower. By L. B. Branch, Engr. U. S. Reclamation Service. 4 ills., 2,000 words. Engineering News-Record. Feb. 21. 20 cts.

Will Cost Half Million to Make Austin Dam Usable. D. W. Mead advises Austin, Tex., that partly rebuilt dam still is defective in foundation and superstructure. 1 ill., 1,300 words. Engineering News-Record. Feb. 21. 20 cts.

Repairing Disintegrated Concrete on Dam with Cement Gun. Dam at Jenkins, Ky., 40 ft. high and 600 ft. long. 2 ills., 700 words. Engineering & Contracting. Feb. 20. 15 cts.

Effect of Covering a Service Reservoir. Author believes every reservoir should be covered. By John Gaub, chemical engr. of Washington, D. C., filtration plant. 2,500 words. Fire & Water Engineering. Feb. 6. 15 cts.

Pumping.

Cost of Operating Electric Pumping Plants in Iowa. Result of investigation by Iowa Engineering Experiment Station. 2,300 words. Engineering & Contracting. Feb. 13. 15 cts.

Pumping Station Addition Built Under Difficulties. Knoxville, Tenn., put temporary 15,000,000 gallon high duty pump on steep hillside between boiler house and tracks. By John W. Hill. 2 ills., 700 words. Engineering News-Record. Feb. 28. 20 cts.

Purification.

Filters and Aeration Remove Oily Taste from Water. Abstract of report by Langdon Pearse and S. A. Greeley. 800 words. Fire & Water Engineering. Feb. 20. 15 cts.

Mixing Baffles Cut Down Chemicals. Materially reduced alum required in mechanical water filtration plant at Jackson, Miss. By John R. Baylis, chemist, Baltimore water filtration plant. 1,300 words. Engineering News-Record. Feb. 21. 20 cts.

Drinking Water Protection in Industrial Plants. Description of sanitary fountain and cooler. 2 ills., 1,200 words. Safety Engineering. February. 30 cts.

Water Waste.

100,000 Tons of Coal Wasted by Chicago. Abstract of report by Chicago Bureau of Public Efficiency, showing waste caused by waste of water by consumers. 5 ills., 4,000 words. Municipal Journal. Feb. 9. 10 cts.

Water-Waste Report Written to Educate Lay Public. Prepared by Chicago Bureau of Public Efficiency. 3 ills., 3,200 words. Engineering News-Record. Feb. 7. 20 cts.

Why Chicago Should Meter Its Water. Abstract of Report by Chicago Bureau of Public Efficiency. 4,200 words. Engineering & Contracting. Feb. 13. 15 cts.

Construction.

Machine Trenches 220 Feet an Hour in Shale. Experience in digging water works trench in Erie, Pa. 1 ill., 1,300 words. Engineering News-Record. Feb. 14. 20 cts.

Los Angeles Water Department Appliances. Methods and appliances developed by department for cutting out pavements, backfilling trenches, making cement joints, etc. By C. W. Geiger. 6 ills., 2,000 words. Municipal Journal. Feb. 23. 10 cts.

Miscellaneous.

Supervision of Public Water Supplies by Health Officer. Abstract of paper before school for health officers. By Jack J. Hinman, Jr. 2,000 words. Fire & Water Engineering. Feb. 20. 15 cts.

Water Supply of Camp Meade, Md. Details of design and construction. By Morris Knowles, supervising engineer. 1 ill., 2,000 words. Municipal Engineering. February. 30 cts.

Water Supply and Sewer System Cap de la Madeline, Quebec. Brief description of pumping plant, reservoir and pipe laying. By Romeo Morrissette. 2 ills., 1,000 words. The Canadian Engineer. Feb. 21. 15 cts.

Rivers as Sources of Water Supply. Considered safe if properly purified. By Robt. Spurr Weston. 2,500 words. Municipal Engineering. February. 30 cts.

STREET LIGHTING AND POWER.

Central Stations.

Plans for Seattle's Proposed Hydro-electric Plant. Brief synopsis of specifications. 400 words. Electrical Review. Feb. 16. 30 cts.

Walnut Station of Columbus Railway, Power & Light Co., Description of new steam-electric generating station. 9 ills., 5,500 words. Electrical Review. Feb. 23 30 cts.

Central Station at Calgary. Description of municipal electric plant. Hydro-electric and steam generated power supplied to street railway and light and power customers. By James F. McCall, supt. and chief engineer. 5 ills., 2,500 words. Electrical Review. Feb. 9. 30 cts.

Electrical Features of Joliet Station. High-pressure steam station of Public Service Co. of Northern Illinois. 2 ills., 2,500 words. Electrical World. Feb. 2. 15 cts.

Light Saving.

Curtailment of Lighting. Discussion before Illuminating Engineering Society on Feb. 14. 2,200 words. Electrical World. Feb. 23. 15 cts.

Curtailment of Lighting Means Small Coal Saving. Figures to show that less than 1% of coal output can be saved. 2 ills., 1,200 words. Electrical World. Feb. 16 15 cts.

Miscellaneous.

Historical Lighting of Independence Square, Philadelphia. Description of past and present lighting. By E. F. Kingsbury. 6 ills., 8,000 words. Journal of Engineers' Club of Philadelphia. February. 40 cts.

Devices for Testing Series Street Lighting Circuits. Home-made motor-driven magneto described. 400 words. Electrical World. Feb. 2. 15 cts.

Location of Switches on Distribution Lines. Accessibility most important. 2 ills., 700 words. Electrical World. Feb. 9. 15 cts.

Inexpensive Remote-Control Switch for Street Lighting. Used on multiple electrolier lighting and signs. 1 ill., 500 words. Electrical World. Feb. 9. 15 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Garbage to Hogs.

Feeding Garbage to Hogs. Abstract of discussion by a conference called by U. S. Food Administration. 1,500 words. Municipal Journal. Feb. 23. 10 cts.

Hog Feeding in Worcester. Description of municipal piggery, methods and results. 800 words. Municipal Journal. Feb. 23. 10 cts.

War-Time Disposal of Garbage. Comparison of reduction and of feeding to hogs, made by committee of Providence, R. I. 1,500 words. Municipal Journal. Feb. 9. Also 2,200 words in issue of Feb. 23. 10 cts. each.

War-Time Disposal of Garbage. Methods employed in eight of the largest cities briefly described. 2,200 words. Municipal Journal. Feb. 23. 10 cts.

An Efficient System of Garbage Collection and Disposal. Collecting garbage of Wilkes-Barre and feeding to pigs. By Fred. Goeringer, Commr. of Public Safety. 3 ills., 1,300 words. The American City. February. 40 cts.

Incineration.

Operation of High-Temperature Incinerator Plant at Savannah. Summary of operation for 3 years and 9 months. By E. R. Conant, city engineer. 6 ills., 2,000 words. Municipal Engineering. February. 30 cts.

Capacity of Toronto Refuse Destructor Exceeds Contract Provision. Top-fed 180-ton plant burns 400 tons a day. By I. S. Osborn. 3 ills., 4,000 words. Engineering News-Record. Feb. 7. 20 cts.

Reduction.

Effect of War on Garbage Disposal. Abstract of paper by I. S. Osborn, discussing effect of decreasing strength of garbage and increasing price received for reduction products. 600 words. Municipal Journal. Feb. 9. 10 cts.

Snow Removal.

Snow Cleaning and Removal in Ottawa. Organization and appliances used. By L. McLaren Hunter, City Engineers Dept. 4 ills., 1,000 words. The Canadian Engineer. Feb. 14. 15 cts.

Snow Removal on Pennsylvania Highways. Methods and appliances used by State Highway Dept. By Geo. H. Biles, Second Deputy State Hwy. Commr. 6 ills., 1,200 words. Municipal Journal. Feb. 16. 10 cts.

Sprinklers and Work Cars Make Good Snow-Plows at Chicago. Wings hinged to sills; used on Chicago surface lines. 3 ills., 700 words. Electric Railway Journal. Feb. 9. 15 cts.

STRUCTURES AND MATERIALS.

Concrete.

Some New Ideas in Concrete. Theories advanced by Prof. Duff A. Abrams, recommending use of "fineness modulus," in proportioning aggregates. 600 words. Municipal Journal. Feb. 16. 10 cts.

Porous Rock Makes Good Concrete of Light Weight. Lava rock proved acceptable and may be used for concrete ships. 700 words. Engineering News-Record. Feb. 28. 20 cts.

Pipe.

Bonus System Applied to Making Concrete Pipe. Description of plan adopted at Armstrong Cement Works. By P. H. Atwood, manager. 1,400 words. Engineering and Cement World. Feb. 15. 15 cts.

Cast Half a Mile of Concrete Pipe per Day. Materials handled in central plant and concrete delivered by motor truck on rails in largest pipe job on record. 4 ills., 1,500 words. Engineering News-Record. Feb. 28. 20 cts.

Subway.

Most Notable Subway in the World. General description of New York's newest subway. 14 ills., 7,000 words. Engineering and Cement World. Feb. 15. 15 cts.

Bridges.

Methods of Maintaining Old Highway Bridges. Repairing old abutments and piers and replacing inadequate foundations; bituminous wearing surface for floors; and painting steel bridges. Paper by G. F. Burch, acting bridge engineer, Illinois Division of Highways. 8 ills., 2,500 words. Engineering & Contracting. Feb. 27. 15 cts.

MISCELLANEOUS.

Motor Truck and Highway Transportation. Paper before American Assn. for the Advancement of Science. By Maurice B. Greenough. 2,500 words. Better Roads & Streets. February. 20 cts.

(Continued on page 216.)

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

March 11-13. — MINNESOTA ELECTRICAL ASSOCIATION. Annual convention, Hotel Radisson, Minneapolis, Minn. Secretary-treasurer, H. E. Young, Minneapolis General Electric Company.

March 13.—VERMONT SOCIETY OF ENGINEERS. Annual meeting, Burlington. Secretary-treasurer, Geo. A. Reed, Montpetier, Vt.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

The Engineering Council.

The Engineering Council, at its recent first annual meeting, elected J. Parke Channing, vice-president of the Miami Copper Company and the General Development Company, chairman; Harold W. Buck, first vice-chairman; George F. Swain, second vice-chairman, and Alfred D. Flinn, secretary. The following committees were appointed:

Executive committee: The chairman, the two vice-chairmen, and David S. Jacobus, Calvert Townley, George J. Foran.

Finance committee: E. Wilbur Rice, Jr., chairman; Charles F. Loweth, Sidney J. Jennings, David S. Jacobus.

Rules committee: J. Parke Channing, chairman; Clemens Herschel, Nathaniel A. Carle, Irving E. Moultrop.

Public Affairs committee: Charles Whiting Baker, chairman; George F. Swain, Benjamin B. Thayer, E. W. Rice, Jr., Charles E. Skinner.

American Engineering Service: George J. Foran, chairman; George C. Stone, Alfred D. Flinn, Dr. Addams S. McAllister, Edward B. Sturgis, secretary.

War committee of technical societies: D. W. Bruntno, chairman; Arthur H. Storrs, secretary; James M. Boyle, Nelson P. Lewis (American Society of Civil Engineers), Edmund B. Kirby (American Institute of Mining Engineers), A. A. Greene, Jr., R. N. Inglis (American Society of Mechanical Engineers), Harold W. Buck, Dr. Addams S. McAllister (American Institute of Electrical Engineers), Dana D. Barnum, E. C. Uhlig (American Gas Institute), Joseph Bijur, Dr. Charles A. Doremus (American Electro-chemical Society), Louis B. Marks, Preston S. Millar (Illuminating Engineering Society), Christopher R. Corning, George C Stone (Mining and Metallurgical Society of America), Henry Torrance, F. E. Matthews (American Society of Refrigerating Engineers).

Fuel Conservation committee: L. P. Breckenridge, chairman; Ozni P. Hood, secretary; Robert H. Fernald, Charles R. Richards, Charles L. Edgar, Carl Scholz, David Moffat Myers, Edwin Ludlow, Harold W. Buck.

The definition of the Engineering Council that was adopted declared that "The Engineering Council is an organization of national technical societies of America created to provide for consideration of matters of common concern to engineers, as well as those of public welfare in which the profession is interested, in order that united action may be made possible."

The "Founder Societies" have 33,000 members.

New England Water Works Association.

The March meeting of the New England Water Works Association is to be held at the Hotel Brunswick, Copley Square, Boston, Mass., March 13. After an executive committee meeting and a lunch, the following papers will be presented:

"The Past and Present Pumping Equipment of the Manchester Pumping Stations," by James H. Mendell, superintendent of water works, Manchester, N. H.

"Recent Legislation and Decisions of the Courts with Reference to the Sanitary Protection of Water Supplies," by Albert L. Sawyer, water registrar, Haverhill, Mass.

"Mountain Scenery," illustrated with colored slides, by Desmond FitzGerald, consulting engineer, Brookline, Mass.

Oregon Society of Engineers.

The following officers were elected for the coming year at the recent annual meeting of the Oregon Society of Engineers held in Portland: President, Orrin E. Stanley, who was formerly secretary of the society; secretary, C. J. Hogue.

Engineers' and Architects' Club of Louisville.

The regular monthly meeting of the Engineers' and Architects' Club of Louisville was held on February 19. A paper on "Concrete Ships" was read by J. E. Freeman.

The officers elected for the ensuing year are: President, Addison W. Lee, Jr.; vice-president, L. C. Baird; secretary, Hermann Wischmeyer; treasurer, National Bank of Commerce.

The board of directors consists of F. H. Miller, J. J. Murphy, Chas. H. Blackman, D. R. Lyman, Warwick M. Anderson and W. H. McAlpine.

Minnesota Electrical Association

The annual convention of the Minnesota Electrical Association is to be held at the Hotel Radisson, Minneapolis, March 11, 12 and 13. Among the more important papers to be presented are "Minnesota Water Powers," by R. J. Thomas, superintendent of the St. Anthony Falls Water Power company, and "Iron-Wire Transmission Lines," by Prof. W. T. Ryan of the University of Minnesota. H. E. Young of the Minneapolis General Electric company is secretary-treasurer of the organization.

Rochester Engineering Society.

The engineering society of Rochester, N. Y., has held a number of interesting meetings during February. Dr. W. F. Stone delivered an address

(*Continued on page* 218.)

MUNICIPAL INDEX

(*Continued from page* 215.)

The Efficiency of the Motor Truck in Terms of Cost per Ton-Mile. Paper before the American Road Builders' Assn. By R. E. Chamberlain. 2,200 words. Good Roads. Feb. 23. 15 cts.

Delivery of the Motor Truck from the Factory to the Seaboard Under Its Own Power. Paper before the American Road Builders' Assn. By Raymond Beck, of the Council of National Defense. 2,000 words. Good Roads. Feb. 16. 15 cts.

Crow's Nest Traffic Signal. Elevated tower for traffic police. 1 ill., 100 words. Safety Engineering. February. 30 cts.

Telegraphs and Telephones in the First Year of War. Effect of the war on operating conditions. By John V. L. Hogan, Vice-Pres. Institute of Radio Engrs. 2,000 words. Electrical World. Feb. 16. 15 cts.

War Time Housing. Suggestions for America taken from England's experiences. By Fred. L. Ackerman. 2 ills., 2,000 words. The American City. February. 40 cts.

Municipal Markets. Considered from the viewpoint of administration. By Judge Frank T. Wilson. 4,000 words. Minnesota Municipalities. February. 30 cts.

Survey Monuments. Iron, bronze and concrete forms in use. Paper before Association of Ontario Land Surveyors. By J. W. Pierce. 1 ill., 2,600 words. The Canadian Engineer. Feb. 21. 15 cts.

Cost Plus Contract for Municipal Work. Details of plan employed by Rosedale, Kans. 2,800 words. Engineering & Contracting. Feb. 13. 15 cts.

Rate Increases to Follow High Cost of Coal. Companies find that rates for electric current must be increased. 1 ill., 3,000 words. Electrical World. Feb. 2. 15 cts.

Plans for Controlling Flood Waters in Miami Valley, Ohio. General description of earth dams and concrete work of project estimated to cost nearly $24,000,000. 4 ills., 5 pages. Engineering & Cement World. Feb. 15. 15 cts.

Commission-Manager Form of City Government Does not Eliminate Politics. Experience of engineer-manager of Cadillac, Mich., indicates that plan does not prevent petty political methods. By T. V. Stephens. 2,000 words. Engineering News-Record. Feb. 28. 20 cts.

113 Miles of Pipe Line Completed in Record Time. How 16-inch pipe was laid over rocky bluffs and across rivers at the rate of a mile a day. By R. E. Morrison. 2 ills., 1,300 words. American Gas Engineering Journal. Feb. 2. 15 cts.

Legal Responsibility for Fires. Advocates holding owners or tenants responsible. 2,300 words. Fire & Water Engineering. Feb. 6. 15 cts.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is a tendency to cut about $2 a ton on 6-inch and $1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

The Rensselaer Valve Company, Troy, N. Y., announces the appointment of M. H. Collins as sales manager of its new Louisville branch.

The Permutit Company, 30 East 42nd street, New York city, announces the appointment of Francis D. West as sales representative in the New York territory. Mr. West was since 1907 chemist in charge of the Torresdale laboratory of the Philadelphia Bureau of Water and is the author of a number of favorably-known articles on water purification, including contributions to Municipal Journal.

Detroit-New York Truck Service.

In order to help relieve railroad congestion and at the same time insure prompt deliveries of tires to its dealers the **United States Tire Company** has established a system of motor truck transportation between Detroit and New York. The first truck, loaded with 4,300 pounds of tires for the metropolitan district, arrived from the big Detroit factory of the tire company after bucking difficult snowstorms on the way east. The big vehicle, a two-ton Pierce-Arrow, was equipped with "Nobby Cord," pneumatic truck tires, and in spite of the strenuous work they were called upon to perform, it was found that neither truck nor tires showed signs of wear. The run from Detroit to Buffalo was made in twenty-eight and one-half hours—excellent time when the conditions are taken into consideration. Between Buffalo and Albany the truck encountered the worst roads and heaviest snows of the trip. Snowdrifts completely obscured the roadbed. This not only slowed down the speed of the last half of the journey, but added materially to the wear and strain on the truck and tires. The United States Tire truck followed an army convoy of sixty trucks out of Buffalo, leaving them at Amsterdam a few hours, before arrival in New York City. Throughout the winter the United States Tire company has been a leader in urging the use of motor cars and trucks to alleviate traffic congestion on the railroads. In and around Detroit where the congestion in the railroad yards blocked traffic for weeks at a time, the Detroit factory of the United States Tire Company supplied the automobile plants in the city and suburbs by car and truck. The company's enormous fleet of cars and trucks has helped greatly in the delivery work during the past few months.

DETROIT-NEW YORK EXPRESS CARRYING UNITED STATES TIRES

Waterworks Manufacturers' Association.

At a meeting of the executive committee of the Waterworks Manufacturers' Association held Feb. 20 arrangements were made for the annual convention of the American Waterworks Association which will be held May 13 to 18 at the Planters Hotel, St. Louis. The following committees were appointed: Executive: E. B. Hodgman, chairman; George R. Ellis, H. F. Brown; entertainment committee: D. O'Brien, chairman; F. B. Leopold; W. C. Sherwood, Fred. Mueller, I. S. Holbrook, W. Van Winkle, Jr.; printing committee: I. S. Holbrook, chairman; D. B. McCarthy; badge committee: J. A. Kienle, chairman; E. K. Sorenson; transportation committee: W. H. Van Winkle, chairman; Fred J. Bradley, T. C. Clifford, H. M. Lofton, L. S. Barnard.

Machinery Manufacturer Wins on Question of Branch Office.—A New York court recently rendered a decision in favor of the Thew Automatic Shovel Co., Lorain, O., which is of decided interest to all construction equipment makers maintaining a branch office in New York state with home office in another state. The Thew Company was plaintiff against Christopher & Lockwood, contractors, for $1,700 for payment due on a steam shovel. The contractors claimed that since the company was an Ohio corporation, and was not registered in New York, it could not bring suit. Judge Morschauer decided that the company was simply represented in New York state by a salesman and that, although the contract was made in Ohio, the company could bring suit in New York. The Thew company was awarded $1,793.06.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., has recently made the following shipments of fire apparatus: Phoenixville, Pa., Brockway type B combination; Duluth, Minn., type 12 pumping engine and hose car; Tyrone, Pa., type 14 combination service truck; Albion, Ia., type 40 combination with Junior pump; Port Huron, Mich., Brockway type B combination; Schenectady, N. Y., type 40 combination with Junior pump.

Market for Pumps and Pumping Machinery in South Africa.—According to consular reports, pumps and pumping machinery are used principally to supply water to municipalities, to meet agricultural and rural needs, and to satisfy the requirements of the mining industry. As mining is the principal industry of both the Transvaal and Southern Rhodesia, the principal demand is in connection with it, and the equipment already in use is valued at millions of dollars, and embraces the most modern and approved types.

Swiss, British and American pumps are used throughout this consular district. The most popular of the pumps manufactured in Switzerland is said to be the "Sulzer," while those imported from England are as follows: Climax, Tangye, Allen Pulsometer, Pearn, Robeson-Davidson, Rees-Roturbo, etc. German pumping machinery has never been extensively used, but the "Hoppe" pump had a fairly large sale previous to the outbreak of the war. However, it is said that the big pumping on the Rand is done chiefly with American machinery, working against heads of from 2,000 to 2,300 feet. Although the American plunger pump is stated to accomplish very good results, gradual inroads upon this system have been made by the high-lift centrifugal pump, which is manufactured both in the United States and on the continent. For municipal purposes water is obtained from underground sources, as the surface-water supply systems are comparatively rare, in view of the scarcity of lakes and rivers of importance near commercial or agricultural centers. In the case of the Witwatersrand, water is obtained partly from drilled wells and partly from shafts sunk in the dolomite formation. The Johannesburg municipality does not pump its own water, but obtains it from the Rand Water Board. The sale of water by this corporation amounted to 9,860,000 gallons a day for the period ended March 31, 1917. This is the largest quantity disposed of, the previous record being that of 9,637,000 gallons attained in 1913-14.

Eliminating the mining industry, the demand for pumping machinery is somewhat erstricted. Pumps are, however. used to some extent on farms and small tracts of land for irrigating purposes. The government has also assisted in this respect by employing a number of its drills to put down wells for farmers at practically the cost price of the work. Wells are usually six feet in diameter and 30 feet to the water level. In most cases the water is elevated 6 feet above the ground. Wells in this country are often fitted with windmill pumps, the use of which appears to be growing more popular.

The imports of pumps into the Union of South Africa amounted to $432,134 and $398,517 in 1915 and 1916, respectively, those from the United States totaling $126,158 and $136,242. In the case of southern Rhodesia, these figures were $33,955, $40,369, $14,258 and $14,361.

The imports of water-boring machinery into the Union of South Africa during 1916 were valued at $991 compared with $13,516 for 1915. These were principally American and British machines. The imports into southern Rhodesia amounted to $33,582 during 1916, of which the United States furnished machinery valued at $31,534. (A list of machinery merchants in the Johannesburg consular district can be obtained at the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its district or cooperative offices by referring to file No. 97005.)

PERSONALS

McGilvray, Thomas F., formerly of the Duluth Engineering Co., and for a number of years city engineer of Duluth, Minn., is now in active training with the United States Engineers at Camp Lee, Petersburg, Va. He was commissioned a major of engineers last April.

Cenfield, F. H., was recently commissioned captain in the Quartermaster's Department. He has been acting head of the efficiency staff of the Chicago city council finance committee.

Hickok, C. E., city engineer of Alameda, Cal., has received a commission as a captain in the Engineer Reserve Corps.

Weirbach, Charles D., city engineer of Allentown, Pa., has resigned to become sanitary engineer for the United States Government under the director of health and sanitation, U. S. Shipping Board, Emergency Fleet Corporation. He will serve as sanitary engineer of the Hog Island shipyard, Philadelphia; the shipyard at Bristol, Pa., and the plant of the Submarine Boat Corporation at Newark, N. J., with headquarters in Philadelphia.

Mumm, Hans, Jr., city engineer of Everett, Wash., recently resigned to join the Portland Cement Association. He will work in eastern Washington and Idaho, with headquarters in Spokane. Mr. Mumm has lived in Everett since 1902. He has been assistant city engineer, county engineer and city engineer, and has also been connected with private concerns.

Aylesworth, M. H., has resigned as a member of the Colorado Public Utilities Commission, of which he was chairman. He is now assistant to the vice-president and general manager of the Utah Power & Light company.

Erb, George E., has been appointed a member of the Idaho Public Utilities Commission. He succeeds Axel P. Ramstet, former president of the commission, who resigned.

Lyman, D. H., for the past eight years chief engineer of the department of engineering, Louisville, Ky., has resigned, effective April 1.

Durham, H. W., major, Engineers' Reserve Corps, is now in command of the 41st Engineers, the first of the new road battalions to be organized for road construction and maintenance, in connection with the work of the expeditionary forces in France.

Cottrell, C. C., is now state highway engineer of Nevada, having succeeded R. K. West, who resigned. Mr. Cottrell has been assistant state highway engineer since the organization of the state department of highways. Previous to that he was connected with the California highway commission for four years.

Thompson, William G., has been appointed as state highway engineer for a term of five years by the New Jersey state highway commission. His salary will be $7,000 per annum. He succeeds Robert A. Meeker, whose term expires on April 1. Mr. Thompson was formerly associated with Major-General Goethals as engineer of construction on the Panama Canal. Edward E. Reed, of Trenton, was appointed assistant engineer for five years at a salary of $5,000.

The following are new officials:

Portsmouth, O.—Mayor, H. H. Kaps; city engineer, Samuel G. Harper; director, public service, Ralph Calvert; director, public safety, Geo. W. Sheppard; police chief, Henry Clark; fire chief, George L. Koerner.

Johnstown, N. Y.—City engineer, Clarence Knowles; chief engineer, fire department, William Duesler; city clerk, Grover C. Yerdon.

NEWS OF THE SOCIETIES

(*Continued from page 216.*)

on Feb. 5 on "Experiences at Our Army Cantonments." Francis W. Davies, assistant chief engineer of the truck dept., Pierce-Arrow Motor Car Co., spoke on Feb. 8 on "Increasing the Earning Power of Motor Trucks." William H. Landreth, deputy state engineer, discussed "Transportation Facilities of the Barge Canal" on Feb. 12. On Feb. 15, J. E. Freeman of the Portland Cement Association spoke on "Concrete Ships and Barges."

Detroit Engineering Society.

On Feb. 15 the Detroit Engineering Society held a joint meting with the Michigan Chapter of the American Society of Heating and Ventilating Engineers. Dr. E. Vernon Hill, sanitary engineer, board of health, Chicago, spoke on "Ventilation—The New Science vs. The Old Art."

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Niagara, Wis., is to construct SEWERAGE and WATER SYSTEMS. The engineer for the improvements is W. S. Shields.

Pender drainage district, Pender, Neb., is to build BRIDGES. Plans for the work were prepared by the Towle Engineering Co.

Extensive PAVING IMPROVEMENTS are to be made by Benscreek, Pa. Plans and specifications are to be prepared by L. R. Owen.

Redding, Cal., is to construct a wooden pipe WATER SYSTEM to cost over $220,000. Plans for the work have been completed by the engineer, W. A. Cooper.

Liberty, S. C., is to build a WATER SYSTEM to cost about $30,000. Plans and specifications for the improvement are to be prepared by the consulting engineering firm, J. B. McCrary Co.

Bonds for $45,000 for a SEWERAGE SYSTEM were recently approved by Seal Beach, Cal. The consulting engineering firm of Olmsted & Gillelen was retained to prepare plans for the work.

Preliminary plans for a SEWERAGE SYSTEM for Grandview, Wash., are being prepared by the C. H. Greene Co.

SEWERS to be built by Union City, Ia, have been planned by the engineer, A. P. Purdy.

A WATER SUPPLY SYSTEM is proposed for Gaylord, Kans. The engineer for the improvement is G. P. Taylor.

Beresford, S. D., is to improve and extend its WATERWORKS. The engineer to plan the works is E. K. Mather.

A SEWERAGE SYSTEM to cost about $230,000 is being planned for Fort Madison, Ia., by the consulting firm of Burns & McDonnell.

The Port of Portland (Ore.) Commission is preparing to extend the city's WATER TRANSPORTATION by starting a steamer line from the city to the Upper Columbia and Snake rivers. H. A. Rands has been retained as engineer to take charge of traffic surveys and make report on possibilities.

Municipal Journal

Volume XLIV. NEW YORK, MARCH 16, 1918 No. 11

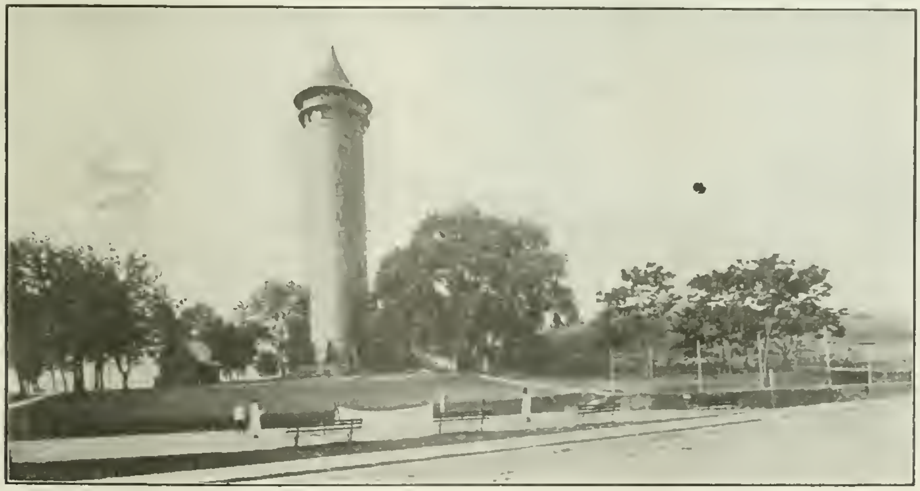
ELECTRIFICATION OF LANCASTER WATER WORKS

Old Steam Plant Built in 1836 Gradually Replaced by More Modern Apparatus—New Electric Plant Has Twenty-one Million Gallons High-Duty Capacity—Description of New Equipment.

By JOHN T. BRAINARD.*

The original pumping plant of the Lancaster, Pa., water works was built in the year 1836, and has developed in size and efficiency from that time until a few months ago, when an electric equipment was installed. Nothing now remains of the machinery of the old water works except a 12,000,000-gallon steam pump and four steam boilers, which will be held in reserve for cases of emergency.

The city obtains its supply from Conestoga creek, which has a water-shed above the city of about 310 square miles and has a minimum flow of about 40,000,000 gallons per day and a maximum flood-flow of 25,000 second-feet. The raw water flows by gravity to low-duty pumps, which raise it to the filter plant. The filter plant has a capacity of nine million gallons per twenty-four hours and is exceeding the bacterial efficiency required, removing 99 per cent and over, and furnishing the city with clear, safe water, regardless of the condition of the creek.



STANDPIPE AND TENNIS COURTS AT EAST END OF RESERVOIR.

After filtration the water passes to a concrete storage reservoir with a capacity of one and one-half million gallons. From the reservoir, the water is led through a 30-inch main to the pumping station, where high-duty centrifugal pumps, electric-driven, deliver it to a standpipe and reservoirs.

The new pumping machinery consists of five high-duty pumps, three low-duty pumps and two vacuum pumps. All of these were furnished by the Earle Gear & Machine Co. of Philadelphia. The electric motors, which were manufactured by the Westinghouse Electric Mfg. Co., are of the 3-phase, 25-cycle, 55-volt, induction, slip-ring type for the high-duty pumps, and of the squirrel-cage type for the low-duty pumps, machine shop and vacuum pumps. The high-duty pumps are centrifugal, 2-stage, direct-driven type, two of 5,000,000 gallons daily capacity each, two of 4,000,000 gallons each, and one of 3,000,000 gallons, a combined rated daily capacity of 21,000,000 gallons per 24 hours. As a matter of fact, on several occasions the two 4,000,000-gallons pumps alone have delivered 11,000,000 gallons of water in a day. The largest pumps are driven by 300-h. p. motors, the 4,000-gallon pumps by 250-h. p. motors and the smallest pump by a 200-h. p. motor. The pumps work against an average head of 231 feet.

The three low-duty pumps are centrifugal, single-phase and pump water from the receiving basin to the filtration plant against a head of approximately 44 feet. These are driven by one 100-h. p. motor and two 75-h. p. A 10-h. p. motor drives the machinery of the shop and two 1-h. p. motors, direct-connected to two vacuum pumps, serve to prime the low-duty pumps. The eleven motors in the plant aggregate 1,562 h. p.

The slip ring motors for the high-duty pumps are started and controlled by Westinghouse magnetic switch-type automatic controllers, which start by cutting resistance out of the secondary of the motor. Interlocks definitely determine the rate at which the motor is

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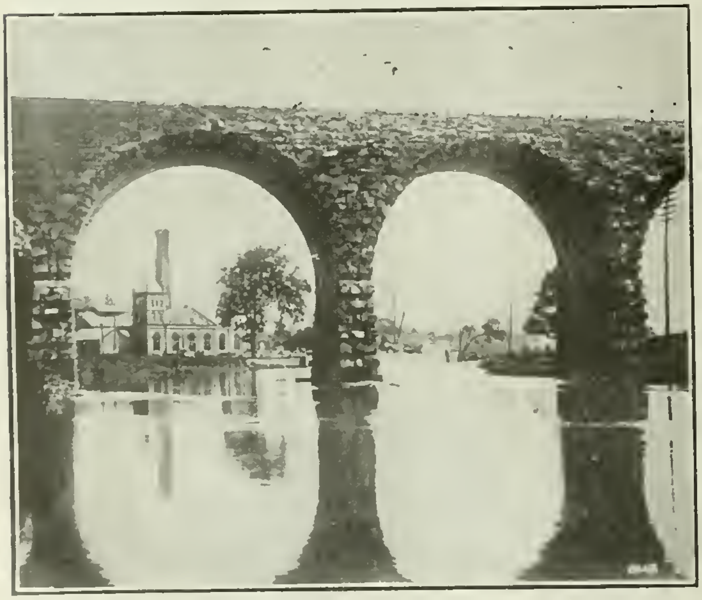
*Secretary, Lancaster, Pa., Water Works.

OLD WATER WORKS, BUILT 1836-7.

brought up to speed. A four-panel board controls the two large pumps and a six-panel board controls the 4,000,000-gallon and 3,000,000-gallon pumps. The control is split to reduce the length of wire from control boards to motor secondaries.



WATER WORKS PUMPING STATION—1917.

The low-duty pumps are started by auto-starters or compensators for reducing primary voltage. The vacuum pumps are started by a single-throw switch. The master circuits to the control for the high-duty-pumps are duplicated in the engineer's quarters and any or all can be started or stopped from that point or from the main board at will.

The energy for the operation of the plant is supplied by the Edison Electric Company and is transmitted from a separate panel at Engleside sub-station by a duplicate 3-phase line which, for a considerable part of the way, is supported on latticed steel towers, run over a right-of-way specially chosen because of its freedom from potential causes of interruptions.

At the entrance to the pumping station grounds is located an iron frame supporting duplicate sets of electrolytic lightning arrestors, with their accompanying choke coils, hook switches and horn gaps. After passing through the choke coils, the energy is brought into the transformer room by duplicate lead-encased high-tension cables.

The transformer room contains four 400-k. v. a. single-phase transformers, 11,000 volt primary and a combination secondary suitable for 2,300 or 575 volts. The present connection is 575 volts. The installation also includes a 10-k. v. a. transformer from 575 to 230—115 volts for lighting the plant and also for lighting a large electric sign on the roof of the plant containing 500 lamps that form the illuminated sign: "Lancaster, Pa. Water Works. Pure Filtered Water."

A panel having ammeters, volt-meter, two graphic and two integrating wattmeters and a circuit breaker, with over-load time limit relays, controls the high tension bus to transformers. A four-panel board controls the three power circuits and the lighting circuits. Each power panel has a separate circuit breaker with over-load and no-voltage trip and graphic recording watt meter. One panel controls the 300-h. p. pumps, another the remaining three high-lift pumps, and one is for the low-duty pumps, machine shop and vacuum pumps. The lighting panel has standard 250 volt knife switches fused on front of board with cartridge fuses.

At the East End reservoir is a 10,000,000-gallon centrifugal pump furnished by the International Pump Co., driven by a General Electric Co. motor which is used, in case of a shut-down at the main pumping station, to pump water from the low reservoirs to the standpipe or high-service mains.

The amount of water pumped during the year 1916 was 2,679,370,000 gallons, while for 1917, the pumpage was 2,552,720,000 gallons, a decrease of 126,650,000 gallons. Last year's pumpage is the smallest that we have had in any year since 1910, when it was 2,567,424,000. The decrease can be attributed to the installation of water meters and the general inspection of the city by five inspectors who are on the look-out for any leaking service mains and faulty plumbing. The charge for water is 5c per thousand gallons by meter, or an average flat rate of $10 a year and waste as much as you like.

Much work remains to be done at the main pumping station in the way of interior repairs, which are now being attended to. The entire work has been under the direct supervision of the superintendent, C. K. Will, and the operation of the pumps is under the direction of the operating engineer, John C. Coyle.

RESERVOIR AND FILTER PLANT—1917.

DANGEROUS "SAFETY" ISLANDS.

Accidents Caused by Low Visibility of Lamp Posts and Poor Shape of Islands—Plan Proposed for Minimizing Danger.

By G. S. EATON.

Safety islands, so called, are provided in the centers of numerous streets in many large cities for two purposes—to offer adequate protection to pedestrians who must cross automobile thoroughfares; and, by fixing lines of traffic as well as by indicating danger points, to minimize collisions and congestion.

On heavily traveled boulevards and streets where motor cars move at high speeds, safety islands may be needed to control traffic even more than to protect pedestrians. Without them a reckless chauffeur may cut across diagonally in front of other machines when turning into an intersecting street and endanger the lives of others as well as his own.

SAFETY ISLAND LAMP POST DESTROYED BY HEAD-ON COLLISION.
Jackson Boulevard and Ashland Boulevard, Chicago.

The use of safety islands dates back only a few years. In the short period since the development of motor car traffic has made their adoption necessary, there has been but little consideration given to ways of reducing the danger which is introduced whenever such a barrier is placed at the center of a much-used pavement.

Much of the danger now connected with safety islands at street intersections must be eliminated before the name is truly descriptive. For both the motorist and the pedestrian, an island of safety as usually constructed has dangerous features. Considerations of safety make urgent the direction of effort toward increasing the visibility of islands and so shaping them as to minimize the effect of collisions.

A short tour made some weeks ago over a few of Chicago's north side boulevards showed two broken island lamp posts. It had been necessary to replace both platform and base of a third island a few days before.

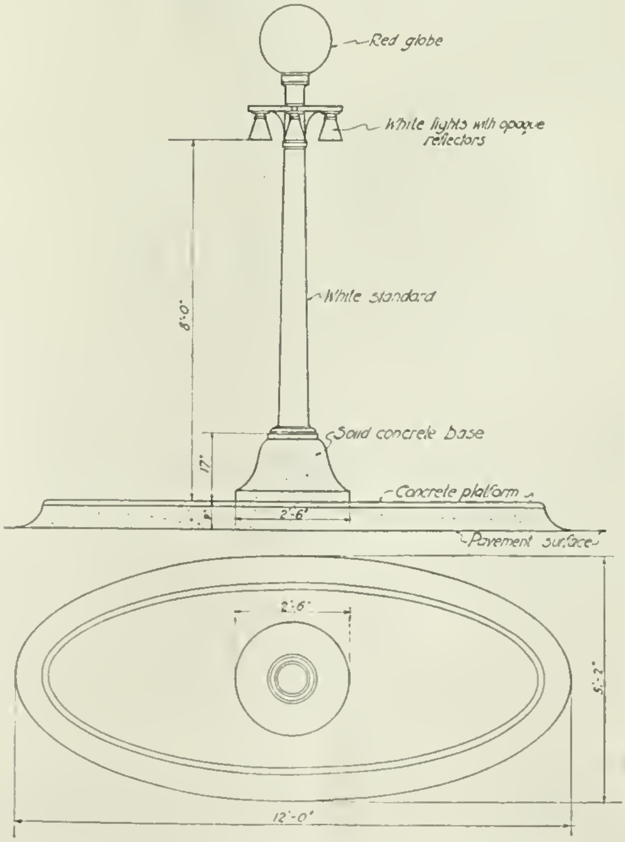
At the 153 safety islands under the jurisdiction of the South Park Commissioners, Chicago, 270 accidents occurred in one year, according to J. F. Foster, general superintendent. These accidents ranged from some in which only the electric light globe was broken to those in which automobile, lamp post and even platform were wrecked.

One of the many accidents occuring to islands under the jurisdiction of the West Chicago Park Commissioners is seen in the photograph showing an automobile with its hood resting on an island platform. The action of the South Park Commissioners, and just recently of the Lincoln Park Commissioners, in having their island lamp posts painted white to give greater visibility, has not yet been followed on the West Side.

Failure to foresee how an island a block away will appear to the motorist as he approaches it at night has been responsible for many of these collisions. Instead of finding before him a black post almost invisible, rising from a platform of indeterminate extent, he should see a white post and base well illuminated. There must be no glare to blind him. Small white lights shielded by opaque reflectors just below the red signal will furnish the illumination needed. On top, a red globe, adequately lighted, will warn the driver of danger and remind him to keep to the right and slow down.

Painting island lamp posts white was first done in Chicago last summer when the South Park Commissioners adopted that practice in order to make islands more plainly visible. With the dark background against which the motorist usually sees the islands, it is only in foggy weather that a dark object might be more easily seen. In this case, the red globe will furnish the dark color.

A white globe with red bulbs within has not proved desirable, nor has the two-color globe—red above and white below—which has been used in an endeavor to illuminate the island adequately. Even though the island is well lighted, an automobile may be forced into it to avoid collision with a recklessly driven car or with a pedestrian. On slippery pavements, skidding into the platform is responsible for many accidents. Shaping the island so that it will turn aside any but a car hitting it head-on will be effective in promoting safety. An automobile striking the island squarely must be stopped if the pedestrian seeking refuge there is to be protected. Experience has shown the necessity of setting



PLAN FOR ISLAND OF SAFETY.

BASE AND POST BROKEN; TEMPORARY POST IN PLACE.
Sheridan Road and Belmont Ave., Chicago.

the platform well into the pavement; otherwise, a heavy car may displace the whole island.

Shape, color and illumination, then, are important features in safety island design. Thought was given to these points in working up the accompanying drawing, which serves to illustrate the design of a safe island of safety.

Buy War Saving Stamps

GARBAGE COLLECTION IN CHICAGO.

Qualities Desired in Cans and Wagons—Practice in Chicago—Water Carriage of Garbage—Keep Handling at a Minimum.

A paper on "Refuse Disposal," read a few weeks ago by Rudolph Hering before the Western Society of Engineers, led to further discussion of the subject by other members, in the course of which Col. Henry A. Allen had the following to say concerning refuse collection and disposal in Chicago:

"It is a fact, as Mr. Hering has said, that the most difficult part of the problem is getting the garbage from the householder into the collecting wagon. The question of the collecting wagon itself and transporting it from there to the disposal works are comparatively simple matters, just plain questions of engineering, keeping in mind unit costs. The question of getting the garbage from the householders to the wagons, however, is a difficult engineering problem. It is the more so as cities are not laid out so that uniform collection apparatus can be used in all sections. Sometimes we have paved streets, sometimes not paved. Sometimes we have alleys, sometimes no alleys. Therefore, up to the present it has been impossible to design a universal, up-to-date garbage box.

"In the selection of a garbage can, its adaptability to be readily loaded onto collecting wagon, or its contents dumped therein, must be given consideration. The size of the collecting box is most important, as, other things being equal, the larger the capacity and the more readily loaded, the greater the efficiency of the entire collecting system. Various types of wagons have been gotten up, several arranged to work in conjunction with the garbage can, so that the garbage is kept entirely from sight during the receiving of garbage from can and in transportation. Just how far this principle is carried depends greatly upon the time during the day that the collection of garbage is made and also on the number of collections made per week. When collections are made three or four times a week very little offense will result, whereas if less often and in hot weather the garbage will emit very offensive odors.

"We tried in Chicago to use a 6-cubic yard box, the reason being that our present garbage box holds about four cubic yards, and rubbish wagons five cubic yards. A 6-cubic yard box would mean a 50 per cent increase in capacity for each single load in the case of garbage and 20 per cent increase in the case of rubbish. But when taking into consideration that only 18 per cent of the alleys are paved and about 60 per cent of the streets, we decided that a 4½-cubic yard box would be the best all-around and convenient size. The larger box would require the use of 3-horse teams in many parts of the city. It would be rather difficult to handle 3-horse teams in many of our narrow alleys. The idea was to design a standard collecting unit that would not only handle garbage, rubbish and ashes, but also night soil, street sweepings, sewer cleanings, manure and material of a similar nature. The result would be the standardization of equipment, such as wagons, motor trucks, barges and handling equipment.

"The Chicago river and the Sanitary District canal are well located for convenient handling of a large portion of the various municipal wastes. The city has one loading station at Chicago avenue (which it is expected soon to move to Goose island), where it is proposed to erect a large loading station for the handling of garbage, rubbish, ashes and manure. We are endeavoring to make this an up-to-date loading station. Another loading station is situated on the North Branch of the Chicago river on Oakley avenue near Diversey street. It is the intention to erect two additional loading stations on the Chicago river or the north branch of the Sanitary District canal to take advantage of water transportation. It is possible that two other stations may be situated on the Sanitary District canal near 14th street and California avenue. These stations will also be convenient for barge service.

"In a paper I read before the American Society of Mechanical Engineers, I made the statement that I considered the following to be an axiom, referring to the handling of offensive substances, namely: that that system of handling offensive substances which exposes the least amount of surface to contact with such substances will be the least offensive, the most sanitary and in the greater number of cases practically the least costly in operation. This idea would mean the keeping of the garbage in the collecting box until final disposition; not dumping it in bins and then re-handling it. In other words, to unload the boxes on reaching the reduction plant but not to dump from the boxes until ready to run it directly through the reduction apparatus. This means an additional number of boxes but the production of less offense at the plant and the saving of a considerable amount of labor. Garbage dumped into pits is very difficult to handle because of matting. In fact, it seems to violate all reasonable rules of mechanics relating to the flow of materials."

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DISINFECTION IN PHILADELPHIA.

In the operation of the Pennypack creek sewage treatment works in Philadelphia (described in Municipal Journal for February 1st, 1912) the sewage, after passing through Inhoff tanks and sprinkling filters, is disinfected before being discharged into the Delaware river. Considering this treatment, the report for the year 1916 gives the following information:

"Owing to the condition of the market it was inadvisable to use bleaching powder this year. A liquid chlorine apparatus was secured and placed in operation on February 8th.

"It was possible to obtain a practically sterile effluent when from 18 to 20 pounds of 35 per cent available chlorine 'bleach' was used per million gallons of trickling filter effluent. But, with the liquid chlorine, it was found that even with proportionately larger amounts of gas it was very seldom that B. coli were not present in the final effluent.

"It is well known that the action of liquid chlorine is much more rapid than calcium hypochlorite, and this led to the thought that only the outside of appreciable-sized particles were being sterilized, while the interior remained unaffected.

"An attempt to slow down the action of the gas by adding lime water to the sewage in advance of the application of the chlorinated water gave a slight improvement. Beginning May 25th, lime water and chlorinated water were mixed in a small baffled tank and fed to the constant-head orifice tank. Using 6 pounds of chlorine gas and 8 pounds of lime a day has made a solution of such strength that about ½ part per million available chlorine is being added to the sewage, and the results obtained are nearly as reliable as when bleaching powder was used to make the disinfecting solution."

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SEWERAGE TERMS.

Recommended for Adoption as Standard by Committee of American Public Health Association—Includes Sewerage and Sewage Disposal.

The following terms and definitions are suggested as standards for general use in connection with sewerage and sewage disposal practice, having been prepared by the Committee on Sewerage and Sewage Disposal of the American Public Health Association. This committee consists of Kenneth Allen, engineer of sewer design to the Board of Estimate and Apportionment of New York; Frank A. Barbour, sanitary engineer, Boston; Harrison P. Eddy, sanitary engineer, Boston; Langdon Pearse, division engineer in charge of sewage disposal investigation, Sanitary District, Chicago, and George S. Webster, chairman, director, Department of Wharves, Docks and Ferries, Philadelphia. Comments upon the terms are given on the editorial page.

Definitions of Terms Used in Sewerage and Sewage Disposal Practice.

Recommended by Committee on Sewerage and Sewage Disposal of the American Public Health Association.

SEWERAGE AND DRAINAGE.

1. SEWAGE.

Sewage is a combination of the liquid wastes conducted away from residences, business buildings and institutions, together with those from industrial establishments; and with such ground, surface and storm water as may be present.

(a) *Domestic Sewage* is that from residences, business buildings or institutions.

*(b) *Industrial Wastes* are the liquid wastes resulting from the processes employed in industrial establishments.

*In the opinion of the committee, the term "Industrial Wastes" is preferable to "Trade Wastes."

2. DRAINAGE.

(a) *Surface Water* is that portion of the precipitation which runs off over the surface of the ground.

(b) *Storm Water* is that portion of the precipitation which runs off over the surface during a storm and for such a short period following a storm as the flow exceeds the normal or ordinary run-off.

(c) *Ground Water* is that which is standing in, or passing through, the ground.

3. SEWERS.

A *Sewer* is a conduit for carrying off sewage.

(a) A *Common Sewer* is a sewer in which all abuttors have equal rights of entrance and use.

(b) A *House Connection* is a pipe leading from a building to a common sewer.

(c) A *Lateral Sewer* is a sewer which does not receive the sewage from any other common sewer.

†The committee is of the opinion that preference should be given to the term "Sub-main Sewer" rather than to "Branch Sewer."

†(d) A *Sub-main* or *Branch Sewer* is a sewer into which the sewage from two or more lateral sewers is discharged.

(e) A *Main* or *Trunk Sewer* is a sewer into which the sewage from two or more sub-main sewers is discharged.

(f) An *Outfall Sewer* is a sewer extending from the lower end of the collecting system to the point of final discharge into a body of water or to a sewage treatment plant.

**In the opinion of the committee, the use of the term "Separate Sewer" is preferable to "Sanitary Sewer," which latter term should be discontinued.

**(g) A *Separate Sewer* is a sewer intended to receive domestic sewage and industrial wastes without the admixture of surface or storm water.

(h) A *Combined Sewer* is a sewer intended to receive domestic sewage, industrial wastes and surface and storm water.

(i) An *Intercepting Sewer* is a sewer generally laid transversely to the general sewer system to intercept all the sewage collected by the sewers of a separate system, or the dry weather flow of sewage and such additional surface and storm water as may be determined from a combined system.

(j) A *Relief Sewer* is a sewer designed to carry a portion of the flow from a district already provided with sewers of insufficient capacity, and thus prevent overtaxing the latter.

(k) A *Storm Water Overflow Sewer* is a sewer designed to carry the excess over a certain volume of combined sewage from a main or intercepting sewer to an independent outlet.

4. DRAIN.

A *Drain* is a conduit for carrying off storm water, surface water, sub-soil or ground water.

(a) A *Storm Drain* is a conduit for carrying off surface and storm water.

(b) A *Land Drain* is a conduit for carrying off sub-soil or ground water, and for draining land.

5. SEWER SYSTEM.

A *Sewer System* is the collecting system of sewers and appurtenances, together with such small pumping stations as may be required to lift the sewage from low-level districts.

(a) A *Combined System* is a system of combined sewers.

(b) A *Separate System* is a system of separate sewers.

6. SEWERAGE WORKS.

Sewerage Works comprise the sewer system, main pumping stations, treatment works, means of disposal of effluent and sludge, and all other works necessary to the complete collection, treatment and disposal of the sewage.

7. SEWER APPURTENANCES.*

(a) A *Manhole* is a shaft or chamber leading from the surface of the ground to the sewer, large enough to enable a man to gain access to the latter.

(b) A *Lamphole* is a small vertical pipe or shaft leading from the surface of the ground to the sewer, for admitting a lantern or reflected light for purposes of inspection.

(c) A *Wellhole* or *Drop Manhole* is a vertical shaft in which sewage is allowed to fall from one sewer to another at a lower level.

(d) An *Inlet* is a connection between the surface of the ground and a combined sewer or drain for the admission of surface or storm water.

(e) A *Catch Basin* is a chamber inserted in an inlet to prevent the admission of grit and other coarse material into the sewer or drain.

(f) A *Flush Tank* is a tank in which water or sewage is accumulated to be quickly discharged later, for the purpose of flushing the sewer.

(g) A *Regulator* is a device for controlling the quantity of sewage admitted to an intercepting sewer.

(h) An *Outlet* is the end of a sewer or drain from which its contents are finally discharged.

(i) A *Storm Overflow* is a weir, orifice, or other device for permitting the discharge from a combined sewer of that portion of the storm flow in excess of that which the sewer is designed to carry.

SEWAGE DISPOSAL.

8. GENERAL TERMS.

(a) *Sewage Disposal* is a generic term applied to the act of disposing of sewage by any method.

*Drain-structures similar to those defined under sewer system, sewerage works and sewer appurtenances are to have like names and definitions.

*(b) *Sewage Treatment* is the process to which sewage is subjected in order to partially remove its impurities or so change them as to render the effluent fit for final discharge.

(c) *Contamination* is the introduction into a water of bacteria or other substances which tend to render it unsuitable for domestic use.

(d) *Pollution* is the introduction into a water of substances of such character and in such quantity that they tend to render the body of water or river objectionable in appearance, or to cause it to give off objectionable odors.

(e) *Influent* is sewage, or partially treated sewage, flowing into any sewage treatment device.

(f) *Effluent* is partially or completely treated sewage flowing out of any sewage treatment device.

(g) *Putrescibility* is the susceptibility of sewage, effluent, or wet sludge, to putrefaction under the conditions to which it is subjected.

(h) *Stability* is the capability of sewage or effluent to resist putrefaction under the conditions to which it is subjected.

(i) *Relative Stability* is the ratio of available oxygen to the oxygen required to prevent putrefaction, expressed in per cent

(j) *Suspended Solids* are those which are removed from sewage or effluent by standard laboratory methods of filtration.

(k) *Settling Solids* are those suspended matters which will subside in quiescent sewage in two hours.

(l) *Clarification* is a relative term denoting the partial removal of suspended and colloidal matter by straining, sedimentation, or by coagulation and sedimentation.

(m) *Colloidal Matter* (conveniently defined) is the suspended matter which is so finely divided that it will not subside in two hours, yet will not pass through a parchment membrane in the ordinary process of dialysis.

9. SCREENING.

A *Screen* is a device containing openings of proper size to retain a part of the suspended matter of sewage.

(a) A *Coarse Screen* is one having openings in excess of one inch in least dimension.

(b) A *Fine Screen* is one having openings of one-fourth inch, or less, in least dimension.

(c) A *Medium Screen* is one having openings intermediate between a coarse screen and a fine screen.

(d) A *Bar Screen* is one composed of parallel bars or rods.

(e) A *Mesh Screen* is one composed of a fabric, usually of wire.

(f) A *Grating* consists of two sets of parallel bars in the same plane, the sets intersecting at right angles.

(g) A *Band Screen* is one consisting of an endless band or belt of wire mesh or other screening material which passes over upper and lower rollers.

(h) A *Wing Screen* is one having radial or curved vanes, usually composed of uniformly spaced bars, which rotate on a horizontal axis.

(i) A *Drum Screen* is one in the form of a cylinder or cone, consisting of perforated plates or a wire mesh which rotates on an approximately horizontal axis.

(j) A *Disc Screen* consists of a rotating circular perforated disc, with or without a concentric truncated cone of similar material.

(k) A *Cage Screen* consists of a cage, usually with sides of parallel bars or rods, so arranged that it may be lowered into the sewage and raised therefrom for cleaning.

10. TANK TREATMENT.

Tank Treatment is the detention of sewage or sewage sludge in tanks, either quiescent or with continuous flow.

(a) A *Grit Chamber* is a chamber or enlarged channel in which the cross-section is so designed that the velocity is such that only heavy solids, such as grit and sand, are deposited, while the lighter organic solids are carried forward in suspension.

(b) A *Sedimentation Tank* is a tank for the partial removal of suspended matter, either by quiescent settlement, or by continuous flow at such a velocity and time of retention as to allow deposition of suspended matter.

(c) A *Dortmund Tank* is a vertical sedimentation tank, usually cylindrical above and with a conical or hopper-shaped bottom, into which the sewage or partially treated sewage is introduced near the center and after rising through the tank passes out at the surface—the sludge being drawn off, without emptying the tank, before it becomes septic.

(d) A *Hydrolytic Tank* is a sedimentation tank in which, by biological processes, a portion of the suspended matter is converted into liquid and gaseous form.

(e) A *Septic Tank* is a horizontal, continuous-flow, one-story hydrolytic tank in which the suspended matter is retained until anaerobic decomposition is to a considerable extent effected.

(f) A *Travis Tank* is a two-story hydrolytic tank consisting of an upper, or sedimentation chamber, with steeply sloping bottom, terminating in one or more slots through which the solids may slide as deposited into the lower or sludge digestion chamber, through which a predetermined portion of the sewage is allowed to pass for the purpose of seeding and maintaining bacterial life in the sludge and carrying away decomposition products, thus inducing digestion of the sludge attended by its reduction in volume.

(g) An *Imhoff Tank* is a two-story hydrolytic tank, consisting of an upper, or sedimentation chamber, with steeply sloping bottom, terminating in one or more slots through which the solids may slide as deposited into the lower or sludge digestion chamber—these slots being trapped so as to prevent the rise of gas and solids from the lower chamber—the lower chamber being provided with vents for the escape of the gases, the tank being so constructed as to facilitate the passage of the sewage quickly through the upper chamber and prevent the flow of sewage through the digestion chamber, and intended to be so operated that the sludge may be thoroughly decomposed, rendered practically free from offensive odor and so filled with gas that it can readily be drawn off and dried.

(h) *Activated Sludge Process* is the agitation of a mixture of sewage with about 15 per cent or more of its volume of biologically active liquid sludge in the presence of ample atmospheric oxygen, for a sufficient period of time at least to coagulate a large proportion of the colloidal substances, followed by sedimentation adequate for the subsidence of the sludge flocculi; the activated sludge having been previously produced by aeration of successive portions of sewage and maintained in its active condition by adequate aeration by itself or in contact with sewage.

(i) *Chemical Precipitation* is the addition to, and thorough mixing with, the sewage of such chemicals as will, by reaction with each other or with the ingredients of the sewage, produce a flocculent precipitant; and subsequent sedimentation.

11. SLUDGE DISPOSAL.

Sludge is the suspended solids of the sewage deposited in tanks or intercepted at the surface of filters, mixed with more or less water.

(a) *Sludge Digestion* is the biological process by which organic matter in sludge is gasified, liquefied, mineralized, or converted into stable organic matter.

(b) *Separate Sludge Digestion* is the digestion of sludge in tanks entirely independent from the tanks in which it is produced.

(c) A *Sludge Drying Bed* is a natural or artificial layer of porous material upon which sludge is dried by drainage and evaporation.

(d) *Sludge Concentration* is the process of reducing the volume of sludge and increasing its proportion of solids by allowing it to stand in a suitable tank until the solids settle down, and drawing off the relatively clean water at the top.

(e) *Sludge Drying* is the process of drying sludge by drainage and evaporation.

(f) *Sludge Dewatering* is the process of removing a portion of the water contained in the sludge by draining, pressing, centrifuging, or by other natural or mechanical processes.

(g) *Sludge Pressing* is the process of dewatering by subjection to pressure, the solids being retained by a cloth fabric which permits the water to pass through it.

(h) *Sludge Coke* is the mass of dewatered sludge resulting from sludge pressing.

(i) *Commercially Dry Sludge* is sludge containing not more than ten per cent of water.

12. MISCELLANEOUS.

(a) *Scum* is a mass of sewage solids, buoyed up in part by entrained gas or grease, and which consequently floats at the surface of the sewage.

(b) *Screenings* constitute the material removed from sewage by screens.

(c) *Grit* is the heavy mineral matter deposited from sewage.

(d) *Sleek* is the oily film of microscopic thickness present on the surface of waters about, and often extending a considerable distance from, sewer outlets.

13. SEWAGE OXIDATION.

Sewage Oxidation is the process whereby, through the agency of living organisms in the presence of air, the organic matter is converted to a more stable condition or into mineral matter.

(a) *Irrigation* is the process of sewage treatment in which the sewage is applied to land for the primary purpose of purifying the sewage and the secondary purposes of supplying water and fertilizer to crops.

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*The term "Sewage Purification" should be abandoned.

(b) *Surface Irrigation* is the process in which sewage is applied to and distributed over the surface of cropped ground.

(c) *Sub-surface Irrigation* is the process in which sewage is distributed beneath the surface of the ground by means of open-jointed pipes.

(d) An *Intermittent Filter* is a natural or artificial bed of sand or other fine-grained material to which sewage is intermittently applied in doses, and which by its capillarity holds the sewage for a time sufficiently long, in the presence of air, to effect by biological processes a high degree of purification.

(e) A *Contact Bed* is a water-tight basin filled with coarse material, such as broken stone, in contact with which the sewage is for a time held by control of the underdrains—the cycle of operation involving periods of filling, standing full, emptying,and resting empty; so regulated as to secure such contact with the bacterial films adhering to the surface of the coarse material, and such aeration of the bacterial surfaces, as may be required to oxidize the sewage.

(f) A *Slate Bed* is a water-tight tank filled with slabs of slate or other similar material, laid horizontally and spaced an inch or more apart vertically, equipped so that it may be filled with sewage, allowed to stand full for a definite period of time, drained and allowed to stand empty for a time, for the purpose of oxidizing the organic matter deposited upon and adhering to the slates.

*(g) A *Trickling Filter* is an artificial bed of coarse material, such as crushed stone or clinkers, over which the sewage is distributed as a spray from fixed nozzles or as a film from moving distributors, through which it trickles to the underdrain system, coming in contact with the bacterial films adhering to the surface of the stones, and in which such aeration of the bacterial surface as may be required to oxidize the sewage is afforded.

*The committee is of the opinion that the term "Trickling Filter" is preferable to the term "Sprinkling Filter" or "Percolating Filter," which are frequently used as synonymous terms.

(h) A *Dosing Apparatus* is the apparatus used for regulating the application of sewage to filters or for applying the required quantity of chemicals to sewage.

(i) A *Dosing Tank* is a tank into which raw or partially treated sewage is introduced and held until the desired quantity has been accumulated, and then discharged at such a rate as is necessary for the distribution essential to the subsequent treatment.

(j) A *Sprinkler Nozzle* is a nozzle used for applying sewage in the form of a spray to trickling filters.

(k) A *Distributor* is a movable perforated pipe, channel or water wheel which distributes sewage upon the surface of a trickling filter. There are two types of distributors—the rotary and the traveling; the rotary moves about a central axis with delivery to a circular filter; the traveling moves back and forth the length of a rectangular filter.

14. DISINFECTION.

Disinfection is the destruction, by the agency of some chemical, of a large percentage of the bacteria in sewage or contaminated water, so as to materially reduce the danger of infection.

15. STERILIZATION.

Sterilization is the destruction, by the agency of some chemical, of all the bacteria in sewage or contaminated water, including their spores.

CAMBRIDGE WATER WORKS NOTES.

Cambridge, Mass., with a population of about 115,000, purchased a private water works plant in 1865, from which has been developed its present system. The original source of supply was Fresh Pond, to which was added, in 1887, a storage reservoir on Stony Brook, from which the water is led to Fresh Pond. In 1897, two large storage reservoirs were formed by dams across Hobbs Brook. The water flows by gravity from the Hobbs Brook and Stony Brook storage reservoirs to Fresh Pond receiving reservoir, and is pumped from this to Payson Park distributing reservoir, from which it flows by gravity to the city.

Fishing in Fresh Pond is permitted to those who obtain permits for this, but is allowed only during the day-time from May to October, inclusive, and everyone using a permit must be accompanied in the boat by an employee as a sanitary supervisor.

At both Fresh Pond and Stony Brook reservoirs, standing grass on the cleared lands of the water-sheds is sold by auction for hay.

The water-shed of Stony Brook reservoir contains a number of residences, and in order to protect the supply, the city has built on this shed 37 cesspools and 19 vaults. During the year covered by the 1917 report, 638,950 gallons of sewage and 59 barrels of solids were removed from the vaults and cesspools by the city.

Owing largely to the considerable age of a part of the distributing system, there is still an undesirable amount of 4-inch pipe in use, this totaling about 16 miles, while there is about two miles of 2-inch and 3-inch mains. These are being replaced by larger pipes as rapidly as possible. Another objectionable feature of the distribution system, which is not so easily eliminated, is that of the dead-ends which seem to be necessitated by the number of courts and private ways into which such dead-ends are laid.

The water department maintains 28 fountains, of which 8 are ice-water fountains. The maintenance of these 8 fountains cost for the last fiscal year $623.64, or $.79 per day per fountain, the greater part of this being for the ice used.

The above information is taken from the 1917 report of Ed. W. Quinn, general superintendent of water works.

TRAINING FIREMEN FOR SERVICE

Special Training Necessary to Make Efficient Firemen—Use of Apparatus, Physical Drill, Administration, Fire Prevention Among Subjects to Be Taught.

In reporting upon the fire department of Indianapolis for the Chamber of Commerce of that city, the New York Bureau of Municipal Research gave the following advice concerning the training of firemen that is applicable to all cities of considerable size, and the principles of which should be adopted by smaller ones as well.

It is now well understood by fire experts that something more is required of an efficient fireman than a good physique and ability to "eat smoke." Special training is required for every step in a fireman's work. Since methods of fire control and extinguishment have practically been standardized, the training of men in the art of putting out fires is no longer a difficult matter and its need is no longer questioned.

Even the ability to extinguish fires promptly with a minimum loss is not all that is necessary to make an efficient fireman. He should also be especially trained to prevent fires by careful inspection and warn householders against common practices conducive to fire, and he should be familiar with every modern equipment for adequate fire prevention.

Provision should be made immediately for the establishment of a training school for firemen which should be under the supervision of one of the assistant chiefs or some member of the department selected because of his special fitness for this service. It would be profitable to have one or more members of the department visit and attend the fire college maintained by the fire department of New York City for a period long enough to familiarize themselves with the methods employed in the conduct of such a school.

The school when established should give courses not only for newly appointed men but also for the present members of the force and the commanding officers as well. The course of study should include:

1. Practical instruction in the following:
    a. Connecting line of hose.
    b. Use of different sizes of hose.
    c. Use of different nozzles.
    d. Stretching different lines of hose through buildings and up the exterior to the roof.
    e. Skillful handling of hose to secure the maximum efficiency of the stream and to reduce loss from bursting hose.
    f. Use of different couplings and connections.
    g. Handling of ladders, including climbing and scaling ladders.
    h. Handling and using of hooks, picks, door-openers and wire cutters.
    i. Emergency repairs to hose (use of jacket).
    j. Tying knots used in the handling of ladders, lines of hose and other equipment.
    k. Taking out broken links of hose already stretched on the outside of buildings.
    l. Use of chemical tanks.
    m. Use of fire helmets and life nets.
2. Administration:
    a. Discipline (respect for authority).
    b. Reports and records.
    c. Responsibility for city property.
    d. Rules and regulations.
    e. Laws and ordinances concerning fire.
    f. Building by-laws.
3. Physical drill:
    a. Setting-up exercises.
    b. Physical appearance.
4. Lectures on the following:
    a. Building by-laws.
    b. Dangerous fires in general.
    c. Precautions to be taken in emptying burning buildings.
    d. General fire fighting.
    e. Care of apparatus and equipment.
    f. Combustibles and explosives.
    g. Sprinklers and standpipes.
    h. Conservation of property in burning buildings.
    i. Auxiliary fire appliance, including special additional appliances.
    j. Water pressure systems (fire hydrants).
    k. Mains.
    l. Different building constructions.
    m Duties of firemen in public theaters and places of public assembly.
    n. Fire preventions.
    o. Fire prevention law and by-laws.
    p. Records and reports.
    q. Hygiene and first aid to the injured.
    r. General discipline.

The period of instruction in the school should be not less than three weeks and as long thereafter as is necessary in the individual case. This school should be used to test the fitness of the recruits for fire service as well as to afford adequate training. When not in attendance at school, the recruits should be required to perform actual service with their companies.

The first step in the development of a course of instruction should be to provide for complete training of the commanding officers in order that they will be qualified to conduct drills in their fire houses.

As a means for providing instruction in practical methods employed at fires there should be established as speedily as possible a Pompier training tower. While such a tower should be completely equipped for training purposes, it need not be of any special type of construction.

When men are in attendance at the school, at least one automobile should be stationed there in order to provide for the prompt transportation of the men to a second alarm fire.

Text-books upon the subject of fire fighting should be secured and placed at disposal of the firemen in each fire station. They should be assigned regular lessons and required to study from time to time and be examined as to their knowledge of the subjects studied.

The firemen should receive instructions daily at the stations. The captain should be held strictly responsible for this. A definite course of instruction to be given by the captain at the stations should be provided. The instruction should not consist merely of what are ordinarily termed company drills, which are invariably conducted during fine weather.

The captains should be required to conduct lectures with respect to the important or extra hazardous risks in their districts. As many as possible of the firemen should be required to inspect such risks with a view to being able to discuss at the fire stations the general condition of the buildings and the methods which should be employed should a fire occur therein.

It is very important that the firemen should become thoroughly familiar with the structure and condition of buildings to which they may be called to extinguish fires. No better means of acquiring this knowledge can be suggested than that the men inspect the property and be required to discuss with their officers and other men in the company the conditions observed. To do this successfully it is necessary that the firemen be provided with a suitable printed form on which to report their observations. That is not the practice at present. It would be of great profit to the firemen themselves and to the city if the firemen would spend their time when on duty in study and in discussing their work rather than remain idle for a greater part of the time as at present.

The education of a fireman can never be said to be adequate until he has received not only scientific training but actual service in all branches of the department. Consequently, every fireman should perform service in hose companies, engine companies, truck companies and chemical companies. His education by reason of experience gained in these various branches of the service should make him competent to handle any piece of apparatus even to the extent of operating the steam engine. There is no logical reason why every man in an engine company should not, in time, be competent to serve as an engineer, and the same is true with respect to the driving of apparatus. There should be no titles or grades which would make any distinction between a fireman assigned to an engine company and one in a ladder or a hose company. Each should be rated as a fireman.

In order that firemen shall have the opportunity to acquire the broadest experience it is recommended that the chief from time to time transfer the members from one company to another, thus requiring a man who has served for a reasonable period in an engine company to perform service for a similar period with a truck company. It is not suggested that this system carry with it any wholesale periodic transfers, but rather that transfers be made as a result of a carefully worked out schedule so as to cause the least hardship to the members. A practical method is to cause the transfers to be first made within districts and upon the recommendation of district chiefs. After a fireman has performed various services in one district he should be given an opportunity in another district.

There are many instances on record of fires in hotels, office buildings and the like where the elevator operators were among the first to desert the building, thus cutting off a means of escape for the people located on the upper stories. Moreover, there are times when an elevator in a building can be used to good advantage in distributing the firemen throughout the building. For this reason it is necessary that firemen receive instructions in the operation of elevators as part of their training. It is therefore recommended that immediate arrangements to this end be made by the chief.

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Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

STANDARD SEWERAGE TERMS AND UNIFORM DEFINITIONS.

Every branch of science, as it develops, finds the need for new words that must be coined to express new ideas, and in many cases different words are used to express more or less loosely the same ideas. Exactness and facility of statement require that a definite and precise meaning of each term used be adopted and generally accepted, and it is also desirable that but one word be used to express the same idea.

Among the various branches of engineering there is perhaps none that more urgently needs such standardizing than does sewerage; although the standardizing of road construction terms also is much to be desired. (A list of "terms for use in referring to highway work" proposed by the American Society of Civil Engineers was given in our issue of March 4th, 1915.) In this issue we publish a list of sewerage terms proposed by a committee of the American Public Health Association, together with definitions of terms in common use but the exact meanings assigned to which are more or less vague.

We hope that all who are interested in sewerage will examine this list carefully, and criticize those terms and definitions with which they do not agree. Our columns are open to such criticisms, and we hope that all who have any to offer will contribute to a discussion of the matter. If any of the terms do not find general acceptance, it is greatly to be desired that others be proposed that will; otherwise the present confusion will continue.

The terms which appear to us most open to criticism, as defined, are "sewage," "sewer" and "drain." The last would apply to a conduit provided for carrying a creek or to one for draining out farm land, as well as to one for carrying the run-off from street surfaces; "sewer" would be confined to a conduit for carrying the waste water from buildings "with such ground, surface and storm water as may be present." A conduit that is built to carry all the storm water and the wastes from buildings as well is a sewer, but one built in the same way and of practically the same size and located under city streets is not a sewer if no waste water from buildings enters it. If a combined sewer is a "sewer," and a farm drain is a "drain," it seems to us that the conduit built under city streets for carrying storm water corresponds much more closely to the former than to the latter, and that the term "storm sewer" is more appropriate than "storm drain." In some cases "separate sewers," "combined sewers" and "storm drains" are all found combined in one system of—what? Sewers or drains?

After a heavy storm a combined sewer may carry fifty times as much storm water as domestic and industrial sewage. Is it still sewage? After a light storm a "drain" may carry enough street washings to make the water much more foul than the highly diluted sewage just referred to. Should it not be classed as sewage? A sewer always carries sewage, but a storm drain is not defined as carrying drainage, although a land drain is.

Until a comparatively few years ago no city built conduits exclusively for house wastes; and the first sewers were built with a view to receiving storm water only, the discharging of house wastes therein being incidental and more or less surreptitious. It is only within the life of the writer that the sewers of Paris were permitted to receive house wastes.

In size, in degree of pollution of the liquid carried, and especially in its association with city streets and city wastes, the conduit under discussion seems to us to correspond more closely with the combined sewer than with the land drain. If we call it a storm "sewer," all of the above inconsistencies and questions vanish.

To paraphrase Mark Twain's report of Adam's (or was it Eve's?) reason for giving its name to the frog: "It looks like a sewer, it acts like a sewer. Why not call it a sewer?"

PREPARE FOR NEXT WINTER'S SNOWS.

Four or five months from now it will be difficult to realize the conditions that, on many of the northern roads during last January and February, interfered seriously with all motor travel on such roads. For this reason, and because opportunities may vanish in the mean time, thought should be taken now by each highway official of what he expects to do next winter in order to keep his roads clear of snow. It may even, in some cases, be necessary to begin at once taking some action in the matter; such as including an estimate of the cost in the budget, or securing legislation that will permit using automobile fees or other maintenance funds for this purpose.

The Highways Transport Committee of the U. S. Council of National Defense has said: "Snows of the present winter have shown the imperative need of a nation-wide effort to keep highways open every day of the year. Storms of unprecedented severity have frequently killed travel over urgently-needed roads and thereby isolated a great percentage of farms. This interruption of travel struck serious blows at the nation's war preparations. It added to the food shortage. It deranged business. It was the direct cause of hardship and material financial loss. Short-haul freight that could not be handled by already overtaxed railroads, but which could have been diverted to clear highways, was piled up to aggravate the already immense congestion. Such a condition would be economic folly at any time; with the nation at war it becomes a national peril. 'Speeding up' is vital to every war activity, and to keep all roads open for the increasing traffic they must bear is now virtually a patriotic obligation."

Everywhere, but especially in the east, we find unprecedented activity in all lines connected with increasing motor truck traffic. Highway departments are arranging to extend their road systems, connect up missing links, and improve the existing roads. Automobile manufacturers are working to capacity in turning out trucks; and organized effort, following the lead of Connecticut, is endeavoring to intensify the service of existing trucks by providing return-load opportunities and keeping all working as nearly as possible at 100 per cent efficiency.

All this effort may be nullified for weeks or even months each winter if snow is allowed to block the roads. This was bad enough last winter. But by next winter a regular highway traffic will have been developed several times as great as the present, and a sudden and complete interruption of this would be as serious as was the railway congestion of a few weeks ago. To make provision for keeping the main roads open next winter is as important as the laying out of a road-building program for next summer. With twice as many soldiers in France to provide for and twice as many ships leaving Atlantic ports, it will next winter be doubly vital to maintain uninterrupted service in this land traffic end of Pershing's lines of communication.

BITUMINOUS PAVEMENT FOUNDATIONS.

Editor, Municipal Journal.

Dear Sir—It is refreshing to note by article in your issue of February 2, page 90, endorsed and supplemented by experience of another writer on page 128 of your issue of February 16, 1918, that two prominent municipal engineers, located more than 1,500 miles apart, have observed and reached the same conclusion, to wit:

1. In every case where the surface is cracked there is "a crack in the (Portland Cement) concrete base, either directly under that in the surface material or only a very slight distance therefrom."

2. "In at least 98 per cent of these cases a crack in asphaltic wearing surface means a crack in concrete base or in close proximity."

3. In no case have any of our asphaltic pavements laid on macadam base developed cracks, including pavements 7 years old.

4. Where the surface mixture has been properly compounded and laid "The cause of cracks in the asphalt surface is undoubtedly in the (Portland Cement Concrete) base, except in those very rare instances where some local case of improper drainage or defective support may cause cracking."

5. "Just so long as asphaltic wearing surfaces are laid on (Portland cement) concrete base, they will crack and there is apparently no effective way of overcoming this tendency or of permanently repairing such cracks."

I say the clear statements of **facts** quoted above are "refreshing" because of the fact that a large percentage of engineers lean to the opinion that Portland cement concrete is the "ne plus ultra" (some would say **"only"**) foundation for paving surfaces.

In a paper before Section D of the American Society for the Advancement of Science, December 28, 1916, on the subject: "Stone and Concrete Foundations from the Standpoint of Efficiency and Economy," the present writer said:

"Bituminous cement concrete, i. e., concrete in which the well proportioned coarse and fine aggregate, which may be either natural gravel and sand or crushed stone and sand heated and mechanically mixed with suitable bituminous cement and spread and rolled on the previously compacted sub-grade, has the extremely important advantage of absolutely overcoming the cracking of Portland cement concrete foundations. It also has the, at least equally, if not more important, advantage of a thoroughly united and unified foundation and surface, the two courses being of the same class of materials. The advantages are:

"(a) Retarding the tendency of the wearing surface slipping or shifting under traffic, either on the base or through the integral parts of the surface rolling on themselves.

"(b) Such a unified foundation and surface also permits the use of a somewhat thinner pavement, both as to surface and foundation, than is equally safe when the foundation and surface are of as widely different and non-unified materials as bituminous surface and either crushed stone or Portland cement concrete foundation.

"In first cost of surface and foundation the difference depends chiefly on the local relative costs of Portland cement and suitable bituminous cements. Under the prices to which Portland cement has advanced during the past two years, there are many sections where pavements using bituminous concrete are lower in cost than Portland cement concrete and in but few places at this time is there any considerable advantage in cost of adequate surface and foundation in favor of Portland cement concrete."

On special request the writer can supply a few copies of that paper, to parties who are interested in the subject.

The fact is that **the very oldest and most successful asphaltic pavements** laid in the United States, particularly in Washington, D. C., Erie, Pa., Buffalo, N. Y., Cleveland, Ohio, and Columbus, Ohio (all laid before Portland cement was commercially available and when "Natural" hydraulic cement was little used) and therefore, before there was any occasion for any Portland cement interest propaganda, were laid on bituminous concrete foundation.

It is high time that engineers and the public generally recognize these facts.

In Warren Brothers Company's experience **it has yet to receive its first report of any cracks in any Bitulithic pavement or Warrenite road, laid during the past seventeen years throughout the United States and Canada, on any type of base except Portland cement concrete.** This business aggregates:

Pavements laid on various types of bituminous base, 25,239,842 sq. yards.

Pavements laid on old macadam road base, 4,153,701 sq. yards.

Pavements laid on Portland cement concrete base, 13,680,091 sq. yards.

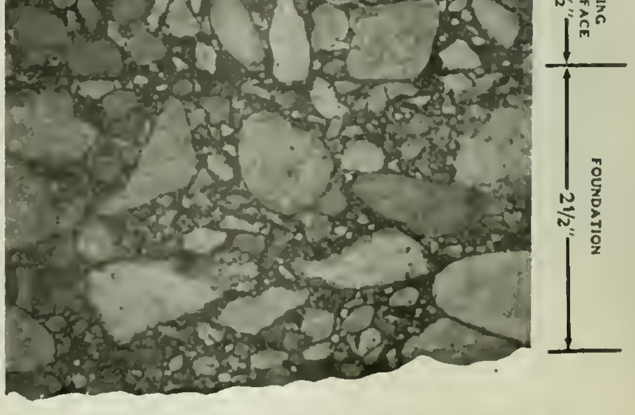
Doubtless the most improved form of "bituminous base" is that known as "bituminous cement concrete" and in some sections as "black" base. It is made of dense mixture, of either crushed stone or gravel and with the completed bitulithic wearing surface has a depth (depending on climatic, soil and traffic conditions) of from four to five inches. This construction is illustrated by the accompanying sawed vertical cross section, being of construction in the U. S. A. Cantonment, Camp Lewis, American Lake, near Tacoma, Wash.

This type of base has been laid in connection with bitulithic pavements and Warrenite roads at forty-one points in the western states and British Columbia, totaling 1,897,174 square yards during the past six years.

The advantages of this dense bituminous cement concrete base are:

(a) Absolutely overcomes cracking.

(b) The surface and base, being of the same character of material rolled together, become thoroughly unified with no line of cleavage. Consequently, not only the entire depth of wearing surface, but the foundation itself is "available for wear" by abrasion of traffic before the sur-



SAWED SECTION OF PAVEMENT WITH BITUMINOUS BASE.
Laid at Camp Lewis, near Tacoma, Wash.

WARRENITE ON ASPHALTIC CONCRETE BASE IN ARIZONA.
This road continuously carries loads like this—a 5-ton truck and 12 tons of cotton on trailer.

face is worn so thin as to not sustain the weight of traffic. It is well known that when an asphaltic surface on Portland cement concrete base wears to a remaining depth of say one inch, it then quickly breaks up under traffic. Not so with dense bituminous concrete base, because the surface and base are "knit" together—no line of cleavage.

(c) Far greater resiliency and therefore minimum of wear by "shock" of traffic as compared with rigid Portland cement concrete base. The difference is relatively comparable to that of hammer blows on pieces of stone resting on a block of hard wood and on an anvil.

(d) A well laid dense bituminous cement concrete base, on a well compacted sub-soil, overlaid with a stable wearing surface, is ample to sustain traffic and, for reasons stated above, the wear and tear is less than in the case of Portland cement concrete base.

The two constructions are about the same in cost, depending on local conditions and costs of materials. Sometimes one and sometimes the other is the lower in cost, but in no case, in the writer's judgment, is the difference either way such as to warrant adoption of Portland cement concrete base because of lower cost. In a very few cases where the subsoil is abnormally weak, the use of Portland cement concrete base is justified whatever the relative cost may be, but experience has proven that this condition prevails only occasionally.

I will gladly send further information and specifications for bituminous concrete base to any who may desire the information.

Very truly yours,
GEORGE C. WARREN,
President, Warren Brothers Company.

RETURN LOADS IN CONNECTICUT

State-wide Organization for Stimulating Motor Truck Freight Hauling for Short Hauls and as Feeders for Water, Trolley and Railway Lines.

The transportation problem has been a serious one in Connecticut, where a considerable percentage of the cities are engaged in the manufacture of war materials, and this was one of the first sections of the country to use motor trucks systematically to aid in solving the problem. The so-called "return load" plan was started in October, 1917, by the Transportation Committee of the Council of Defense. The chairman, Wm. S. Conning, described the operation of this plan before the latest meeting of the Highway Traffic Association of the State of New York.

On first taking up the problem, the committee increased by 100 per cent the tonnage hauled by the trolley companies, and developed the service rendered by the Connecticut river and Long Island sound steamers. Trucks, however, were needed both as feeders of these and for short-distance hauling within the state. The committee, through the State Automobile Department, requested all owners of motor trucks in the state to report what time and capacity of truck they could furnish for carrying return loads. About 700 expressed their desire to increase the amount of freight they were carrying.

Transportation bureaus were then established in every large city and entered in the telephone books under the heading "Return load." At each bureau is registered the number, name and address of every idle truck, whether idle the whole or a part of the time. Also every truck was registered that had an established route between two cities, and the days when deliveries were made in the case of privately owned trucks such as grocers, manufacturers, and public trucks; and all were urged to make no trips empty but to carry loads both ways. As soon as a bureau was established, each truckman in the territory was asked to register there. The bureau also obtained a list of the shippers in each territory and sent a letter to each one explaining the plan and asking him to call upon the bureau when he had freight to be carried. What seemed to be the best way to gain cooperation was meeting with boards of trade, traffic men's associations and similar organizations and explaining to them the plan in great detail.

No difficulty was found in securing idle trucks. In each city of about 100,000 it is safe to say that there are 100 trucks idle either all or part of the time, of one to five-ton capacity, and many more owned by private firms that are willing and anxious to carry return loads and thus make their trucks 100 per cent efficient.

There are now fourteen bureaus established, and a map has been prepared showing the various truck routes and the locations of the bureaus, a copy of which map is furnished to each bureau, together with a card index showing the location of the truckmen represented by each route number shown on the map. In small towns where there are only a few trucks, the State Council has asked a town committee to post the truck information in a central place where any shipper can readily obtain the information. An effort is being made, however, to keep in touch with the small towns through the large bureaus. The bureaus were all started in Chambers of Commerce or similar organizations, but several have since been made a part of the War Bureaus organized by the State Council of Defense, which plans to consolidate all war work under one head.

The question of rates has come up many times, but the committee has always taken the attitude that the sole function of the Traffic Bureaus is to get the truckmen and shippers together, and that they must settle the rates between themselves; it being fairly well established that, as return loads cut the cost to the carrier, he therefore cuts the cost to the shipper where he can get his return load assured.

In many instances return loads have been obtained for Connecticut trucks going into New York and Massachusetts by means of information filed with the secretary at Hartford, but it would greatly facilitate the movement to and from other states if they would establish bureaus where Connecticut truckmen could call for loads or arrange for them before leaving Connecticut with a load for the state in question. Mr. Conning believes that the work of the committee has been well worth-while and has accomplished a great economic good in Connecticut, and that the plan will be continued after the war is over because of the appreciation of this.

On March 7th the New Jersey State Council of Defense asked all mayors of cities of 10,000 population or more to establish return load bureaus for carrying out in that state the plan outlined above. It is expected that thirty-five municipalities in that state will establish such bureaus.

The WEEK'S NEWS

Progress of Federal Aid Highway Work—State Control of California Highways—Twenty-Year Rate Fight Lost by Denver—Provincial Competition Puts Private Company Out of Business—Higher Electric Rates for Illinois Cities—Power Projects of Los Angeles—Fires in Canton and New York—New City Managers in Beaufort, S. C., and Madill, Okla.—New York Has Power to Seize Coal—Plans for $50,000,000 Federal Housing.

ROADS AND PAVEMENTS

Black Milestones for Neglected Federal Aid Roads.

Washington, D. C.—According to a recent statement by Logan Waller Page, director, U. S. Office of Public Roads, regarding maintenance of Federal aid highways, "should the state fail properly to maintain a federally aided road, Uncle Sam, it is planned, will put the milestones in mourning. They will be painted black. So these F. A. R. markers will stimulate the interest of the community in its roads." The same statement says that the country has 2,450,000 miles of public roads and about 11 per cent of them are improved with some kind of surfacing. The modern hard surfaced roads, including macadam or better, constitute not over 5 per cent of the total. "Out of 228 projects submitted by the state highway departments to November 30, 1917, inclusive, 168 have been approved and only six disapproved. The amounts of Federal aid involved in the projects submitted is $5,664,442.31; the total, including state and local funds, $13,583,577.98; the total approved is $4,052,142.85 in Federal funds and $9,770,179.40 in Federal, state and local funds. Those states which had highway departments at the time the apportionment was made for the fiscal year ended June 30, 1917, must enter into the project agreements on or before June 30, 1918, or the amount allotted to them and not covered by project agreement will be reapportioned under the terms of the act to all of the states. Of the 168 projects approved eighty-eight sets of plans and specifications have been submitted. Of this latter number seventy-two have been passed by our engineers and recommended for approval, so that only sixteen sets of plans and specifications submitted are now pending. All Federal aid roads will be specially marked. Marking posts will be concrete, about four feet high, modeled after the Washington monument. On the side next the road will be two shields; one the shield of the United States with an eagle and the initials F. A. R. (federally aided road) and the other the state shield. Means are being studied whereby these posts may be made into milestones, wherever this is practicable, because where only a section of a road is built by Federal aid and the rest of that road is built by the state without Federal aid, it will not be possible to identify it with the F. A. R. milestones, but simply by markers showing the boundaries of the section constructed with Government aid. These markers will indicate the distances in both directions of the nearest large city in the state and the nearest large city in the adjoining state."

State Commission Controls Use of Highways.

Sacramento, Cal.—The fact that persons owning land adjacent to a state highway have been cuting down trees within the road limits and have tried to justify their acts by claiming to have received permission from their local board of supervisors, has caused the state highway commission to order a strict enforcement of the law regarding such actions. The control of all public highways, which have been taken over and adopted as portions of the state highway system, is vested in the state highway commission. To remove any doubt as to jurisdiction and to prevent further destruction of trees, and also to encourage the planting and preservation of such, the highway commission has issued special instructions to all county boards of supervisors and district attorneys. The law on this point provides:

> "No state road or highway shall be dug up for laying or placing pipes, conduits, sewers, wires, railways or other objects, and no tree or shrub in or on any state road or highway shall be planted, trimmed or removed, and no obstruction placed thereon, without a written permit, and then only in accordance with the regulations of such Department of Engineering or its duly authorized officers or employes; and the work shall be done under the supervision and to the satisfaction of the Department of Engineering or its appropriate officers or employes, and the entire expense of replacing the highway in as good condition as before shall be paid by the persons to whom the permit is given or by whom the work is done; but a city or town may, within its corporate limits, dig up a state road or highway without such approval or permit in case of immediate necessity; but in such cases it shall be forthwith replaced in as good condition as before at the expense of the city or town.
>
> "Any person convicted of making any opening in a state road or highway or placing any structure thereon, or changing or renewing any structure thereon without obtaining a permit as herein provided, or not in compliance with the terms of such a permit, or otherwise violating the provisions of this act, shall be guilty of a misdemeanor."

Big Road Bond Issue Invalid—No Election Booths.

St. Joseph, Mo.—The $2,000,000 bond issue voted at the recent election by Buchanan County, Mo., bas been declared invalid. The decision is based on the facts that election booths were not used and that the voters had not been notified of the new location. The majority at the election was 5 to 1 for the issue. It is understood that a new election will be held.

WATER SUPPLY

Denver Loses Twenty-Year Water Rate Fight.

Denver, Colo.—The city of Denver in the Supreme court at Washington, has lost its fight of twenty years' duration against the Denver Union Water Company over consumers' rates. Injunctions restraining the city from enforcing an ordinance reducing water rates 20 per cent, alleged to be confiscatory on the ground that it would take the company's property for public use without compensation, were sustained. Justices Holmes, Brandeis and Clarke dissented, being of the opinion the proceedings should be dismissed. Lower court valuations of the company's property at $13,415,899 were upheld. Since the proceedings were instituted the city obtained an option to purchase the property on the basis of that valuation. The water company contended the ordinance's provisions were so unreasonable and burdensome as to make it invalid, would reduce the company's returns to 2.88 per cent, that the ordinance was passed without any investigation and that its true object was to force the company to sell its property to the city at less than real value. Denver officials denied any intention to confiscate property, asserted the ordinance would yield larger returns than claimed and contended the company did not operate its plant economically. In holding that the 20 per cent horizontal reduction in water rates of the Denver Union Water Company, as authorized by the city council in 1914, is unreasonable the court also fixed a price of the plant valuation that is to be the subject for a special election within a year, according to an agreement pending between the city and the company. Following the appeal of the water company rate case to the Court of Appeals and later to the highest tribunal, the company gave the city an option to purchase the system based on the valuation given by Special Master W. J. Chinn. The Chinn price was $13,415,899. The Supreme Court now upholds the appraisement of the Denver Federal court as submitted by Master Chinn. The company is bound by the agreement entered into some months since to abide by the ruling of the United States Supreme court. This last decision relieves the company from paying back to customers approximately $1,000,000 for the reason that pending the ultimate determination of the case the proposed reduced rates were held in abeyance by court order. Special Master Chinn, who was appointed by federal judge Robert E. Lewis to determine whether the rates under the proposed reduction would bring a fair and adequate return, found that only 3.64 per cent would be realized, which he held to be insufficient. The Chinn valuation included $2,947,617 in water charges for payments, railway tracks, telephone conduits and other civic improvements that necessitated the tearing up of streets.

Discontinue Free Water List.

Sandusky, O.—Complying with instructions of state examiners, based upon an opinion of attorney general McGee, city manager Lehrer has ordered that free service of city water to hospitals, parochial schools, Carnegie library, the county Children's Home, cemeteries, etc., be discontinued. The order dates from January 1, this year. All of the institutions affected have been receiving free water, although it was metered, and it is roughly estimated that the amount consumed might represent a revenue of a thousand dollars. The county has been paying for the water for the court house, jail and infirmary. Since the city appropriates money for the hospitals and library and owns and maintains Oakland cemetery, the charging for water in these cases will have no material effect. Officials say, however, that it is necessary under the order, which was issued to all water works examiners and which quotes the ruling by the attorney general as follows: "Where departments, institutions or individuals receive water from a municipal water works without charge and without authority of law, such departments, institutions, or individuals may be held liable for such water received and the officer responsible for the management of such water works may be held civilly liable for water so furnished, and a reasonable estimate of the water so furnished, based upon the circumstances of each particular case, may be the basis for recovery." The instructions further read: "We feel that our examiners have all been thoroughly advised as to the differences between legal free water and illegal free water and you are hereby ordered from and after this date in all examinations to make findings for recovery jointly against the department, institution or individual receiving such illegal free water, together with the director of public service who illegally furnished such free water, based upon your best estimates. It is the further opinion of the writer that a director of public service allowing free water illegally is also subject to the provisions of sections 4263 and 4268 relative to nonfeasance in office and gross neglect of duty, as he is responsible for the conduct of the water works in conformity with law."

STREET LIGHTING AND POWER

Company Cannot Meet Government Competition.

London, Ont.—Failing to compete with the rates of the Provincial Hydro-Electric Power Commission, the London Electric Company, Ltd., a corporation controlled by Mackenzie & Mann, has decided to suspend operation. The London Electric Company has announced to its customers, who use about 2,500 h.p., that it will end its business at once. Its plant will be dismantled and scrapped. The London Electric Company formerly sold power for 9 cents per kilowatt-hour net, plus meter rent. When the Hydro-Electric Commission entered the field it charged 4.5 cents per kilowatt-hour. It gradually reduced charges to 1.5 cents per kilowatt-hour, and the London Electric Company was unable to stand the cutting. When the private company was unable to secure coal for its plant during the recent shortage, directors decided to suspend operation. It is reported that the Ontario government has ordered Mackenzie & Mann to turn over two of its generating machines at Niagara Falls, Ont., to the Hydro-Electric Commission.

Gas and Electricity Consumption in New York.

New York, N. Y.—The state public service commission for the First District in its report to the legislature says: "The most recent statistics for gas and electric companies are for the calendar year 1916. In that year gas companies in New York City manufactured and sold 44,565,753,000 cu. ft., an increase of 4.76 per cent. Sales of electricity, however, showed a very much higher percentage of increase, the enlarged use being accounted for in great part by the material reductions in Manhattan, the Bronx and Brooklyn. Increase in population was also partly responsible. Electric companies sold to the public 846,201,369 kw.-hr. and received therefor $38,687,806, an increase of 16.40 per cent. Consumers numbered 360,669, against 306,217 in 1915. Gas sales were about $6.61 per capita and electric about $7.03 per capita."

Many Towns Affected by Higher Rates.

Springfield, Ill.—Orders have been entered by the public utilities commission in a number of cases. One order suspends to June 28, 1918, proposed rates for electric power, filed by the public service of northern Illinois, affecting 144 towns, among them Kankakee and Joliet; and authorized the company to issue $2,000,000 of gold notes and $2,667,000 of gold bonds. The Central Illinois Utilities company is authorized to put into effect a rate of 16 cents a kilowatt-hour for residence lighting covering the first thirty hours and nine cents for all electricity used in excess of thirty hours, and other rates for heating, etc. Twenty-seven towns are affected by this order. The Central Illinois Lighting company is permitted to withdraw its flat rate steam heating rate at Peoria and substitute a meter rate after October 1, 1918. Certain commission rules requiring free electric and gas extensions to consumers are suspended, as requested of the public utilities commission by the Quincy Gas, Electric & Heating Company. The high cost of materials was given as the reason for the request.

Los Angeles May Develop More Power.

Los Angeles, Cal.—A recent conference held here between representatives of the state, the public service commission and the state fuel administrator discussed the diversion of city funds for duplication of the present distributing system to the development of aqueduct water power. This followed the Federal fuel administrator's recommendation to develop hydroelectric power in order to conserve oil fuel. E. F. Scattergood, electrical engineer, Aqueduct Power Bureau, reported that of the $5,000,000 voted for a distributing system nearly half was available. Aqueduct power could be developed to supply all consumers now served by the Los Angeles Gas & Electric Company steam plants. This could be effected within a year, he believed, by completion of power plant No. 2 in San Francisquito Canyon and utilizing to the full the capacity at No. 1. This would mean a total of 33,000 h.p. added to the present capacity. The total cost of consolidating the three Los Angeles systems and increasing city generating capacity to a point where it could meet all needs would be about $1,400,000 at present machinery quotations, but 35 per cent of this could be saved and prompt delivery of machinery assured if government intervention could be secured. Of this total about $40,000 represented cost of connection with the Los Angeles Gas & Electric Corporation, which could be effected in about a month. The report says: "In addition to supplying the 9,000 consumers and the street-lighting load connected to municipal lines as well as power requirements under the operating agreement with the Southern California Edison Company, the city plants have a large surplus capacity. From this surplus the city is now supplying all power used by the Pasadena municipal plant, thus eliminating consumption of approximately 5,000 bbl. of fuel oil per month at the Pasadena steam plant. In addition to supplying Pasadena, the city plants have surplus sufficient for practically all of the electric power generated by the Los Angeles Gas & Electric Corporation steam plants for use of electric consumers of that company within the city." It is estimated that the substitution of aqueduct power for that generated by the private company in steam plants would save 45,000 barrels of oil per month. The private company has offered to purchase the available power from the city or to co-operate in oil conservation in such other manner as the fuel administrator may recommend.

FIRE AND POLICE

Difficult Fire Destroys Block.

Canton, O.—The worst fire in the city's history totally destroyed with all contents the Swearingen building, the city's largest business block and the buildings adjoining it on the south, gutted the building west of the Swearingen building, and seriously damaged adjacent stores by smoke and water. The total loss is estimated at over $150,000, with partial insurance. All the contents of the several offices in the Swearingen block are total loss, with small insurance. One man was seriously injured by a fall from a ladder. John Beadles, fireman, suffered severe bruises from fragments of falling wall; three men were overcome and were dragged out in a semi-conscious condition. Chief of police Kitchell missed death by a hair's-breadth under a falling ladder and several firemen and volunteer assistants had narrow escapes from flying debris, falls and other menacing incidents during the long fight against the difficult fire.

Chief and Firemen Injured in Blaze.

New York, N. Y.—Fire in a six-story tenement resulted in severe injuries to ten persons, among them five firemen, including battalion chief John McLoughlin, who is now in hospital in a serious condition. Chief McLoughlin and the other firemen received their injuries when a burning staircase from which they were directing a hose into the flames on the third floor collapsed under them, and buried them one story below under a mass of blazing debris. Three children, a man, and a woman were also badly hurt before the flames were extinguished. The fire started on the second floor, when an oil stove was accidentally overturned by the sudden opening of a door. The blaze spread quickly from room to room, and the whole second floor was aflame when the firemen arrived. There were some forty children and adults in the building. When battalion chief McLoughlin arrived he decided to fight the fire from the fourth floor, and leaped up the stairs, followed by his company. The firemen hurried through all the rooms, picking up children here and there and passing them to the nearest fire escape, where they were led down to safety by other firemen. Rescue work was hampered because many of the fire escapes were clogged with clothes and utensils. While directing his men on the staircase leading from the third to the fourth floor, chief McLoughlin suddenly felt the stairs tremble under him. Before he could call his men out of danger the stairs collapsed, and he and his men fell to the third floor.

GOVERNMENT AND FINANCE

Vote in Favor of Commission Form.

Cape Girardeau, Mo.—The voters at the special election declared in favor of the commission form of government by 191 majority in a light vote cast. The total vote was 1,093, there being 642 for and 451 against the proposition. Following the election a mayor and two councilmen were elected at the regular city election after the candidates for the three positions were chosen at a primary just prior to the date of the regular municipal election.

Beaufort's New City Manager.

Beaufort, S. C.—The new city manager, who succeeds H. G. Otis, now manager of Auburn, Me., is John R. Kneebone, formerly on the staff of the city engineer of Flint, Mich. He had been in Flint since July 1, 1916, serving first for six months as civic secretary for the St. Paul Men's Club and later as cost accountant in the city engineering department. Mr. Kneebone received his A. B. at the University of Michigan in 1915. The university has given him the new degree of "master of arts in municipal administration." He is one of three men to enter this course, the first to be given in the United States, and is the first to complete it, the other two men having left the university to take positions as city managers. He is said to be the youngest city manager in the country.

New City Manager Appointed.

Madill, Okla.—H. C. McDuffie, who was recently appointed city manager under the new commission-manager charter is to receive a salary of $1,800 a year. The population of Madill is less than 4,000.

MISCELLANEOUS

City Given Power to Seize Coal.

New York, N. Y.—Mayor Hylan recently signed the ordinance passed by the board of aldermen, authorizing the city to seize coal for the general welfare, in the interests of health and for the relief of the poor of the city. As the mayor believes that some of the public service corporations have more coal stored than is necessary the fuel administration is watching with considerable interest to see what the mayor will do. Under the ordinance the mayor can acquire in the name of the city any coal within the limits of the city. The ordinance provides that thirty days after taking the coal the corporation counsel shall apply to a justice of the supreme court for a determination of the amount of compensation the owner shall receive. No advantage has yet been taken of the ordinance.

The $50,000,000 Federal Housing Project.

Washington, D. C.—President Wilson has signed the act of Congress appropriating $50,000,000 for housing shipyard workers. The fund will be administered by the United States Shipping Board. In preparation for this legislation the Emergency Fleet Corporation has for a long time been organizing its housing forces under the direction of J. Rogers Flannery, president of the American Vanadium Co., of Pittsburgh. Mr. Flannery will head the housing division of the corporation and will be assisted by Meyer Bloomfield, until now head of the industrial service division of the Fleet Corporation. Plans and construction have already progressed far in one shipyard, that at Bristol, and a special allotment of $8,000,000 for similar purposes has just been made for one of the other Government yards at Hog Island, Philadelphia. No housing will be provided at the Submarine Boat Corporation's plant at Newark, N. J., the third Government agency plant. Mr. Flannery has announced that the new funds will be expended not only in the outright purchase and construction of houses at the Government yards, but in improving transportation facilities and in loaning money for housing to the private yards engaged on Government contracts. Representative Frank Clark, of Florida, chairman of the Committee on Public Buildings and Grounds, introduced a bill in the House of Representatives appropriating $50,000,000, to be expended under the direction of the Secretary of Labor "for the purposes of providing housing, local transportation and other community facilities for such industrial workers as are engaged in industries connected with and essential to the national defense, and their families, only during the continuation of the existing war." This bill takes the place of the one taken from the Committee on Labor by Mr. Clark's committee and is the only housing bill now before Congress. The bill gives the broadest powers to the Secretary of Labor except that it forbids him to make a "percentage or cost-plus contract for any work under this act." The Secretary of Labor has made Otto M. Eidlitz director of housing of the department, and he will administer the funds provided by the new bill if it is enacted.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

March 27-28.—INDIANA SANITARY AND WATER SUPPLY ASSOCIATION. Annual convention Claypool Hotel, Indianapolis. Secretary, W. G. Ulrich, Indianapolis Water Company.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

Ontario Good Roads Association.

At the recent annual convention of the Ontario Good Roads Association held in Toronto technical papers and addresses were appreciated by a good-sized body of members. Hon. Findlay Macdiarmid, minister of public works, Ontario, announced that all the counties in the province with two exceptions were co-operating in the good roads movement. The question of placing a tax of 2c. per foot on property facing county roads was discussed, but a resolution to that effect was defeated. The following officers were elected: Honorary presidents, J. A. Saunders and S. L. Squires; president, C. R. Wheelock; secretary-treasurer, Geo. S. Henry.

Illinois Highway Improvement Association.

The $60,000,000 good roads bond issue for the state was the principal topic of discussion at the well-attended convention of road boosters of the Illinois Highway Improvement Association held Feb. 26 and 27 in Peoria.

Most of the conference centered on whether it will be possible to utilize local materials and labor, with a minimum burden upon the transportation systems, in improving the state aid roads between Springfield and Chicago. Opposition to road work during the war as being a drain upon labor resources and transportation facilities, it is hoped, will be overcome by planning for the use of Illinois river gravel and the use of labor that would not be used in farm work or in the production of war necessities.

Gov. Lowden and other state officials were in attendance at the meetings. A banquet with a special program of addresses and music concluded the first day's sessions.

Civil Engineers' Society of St. Paul.

About 150 members attended the annual banquet of the Civil Engineers' Society of St. Paul and reception to the new officers. These are: President, A. F. Meyer; vice-president, E. S. Spencer; secretary, P. C. Ganger; treasurer, E. O. Korsmo.

New Jersey Sewage Works Association.

The New Jersey Sewage Works Association recently elected the following officers for the ensuing year: President, Paul Molitor, Madison; secretary, Fred T. Parker, Atlantic City. At the recent meeting of the association, George F. Fuller, consulting engineer, New York, read a paper on the operation of sewage work plants.

Connecticut Society of Civil Engineers.

At its 34th annual meeting held recently at Hartford, the Connecticut Society of Civil Engineers gave over one and a half days to technical meetings. A banquet ended the first day. In spite of the war conditions and many of the members being away on war service, meetings and banquet were well attended. William R. Dunham, Jr., chief engineer of the Connecticut Co., New Haven, was elected president for the ensuing year. J. Frederick Jackson, of New Haven, is secretary of the society.

Iowa Association of County Engineers.

The Iowa Association of County Engineers held a meeting Feb. 27 and 28 at Ames under the auspices of the state highway commission, at which road and bridge work prospects for next year were taken up.

Brooklyn Engineers' Club.

At the Feb. 14 meeting of the Brooklyn Engineers' Club, Andrew F. Johnson spoke on "Some Notes on the Development of Electric and Gas Facilities in Central and Eastern Long Island."

Highway Engineers' Association of Missouri.

The eleventh annual meeting, a three-day convention, of the Highway Engineers' Association of Missouri was recently held in Kansas City. More than a hundred members from all over the state attended the opening session. Alexander W. Graham, state highway engineer, delivered an address on "What the State Highway Engineer Expects of County Highway Engineers in 1918." Papers were read by B. H. Bain and T. C. Stanley on various engineering phases of road building. C. E. Smith, consulting engineer, St. Louis; J. C. Travilla, consulting engineer for the Dunn Wire Cut Lug Brick Co.; Harvey S. Owen, engineer with the Portland Cement Manufacturers' Association, and S. M. Williams, president of the Highway Industries Association, read papers. After the third session, Prof. E. J. McCaustland, of the University of Missouri, urged co-operation of the university with the highway officials of the state. Walter Buehler, of the Barrett Manufacturing Co., discussed the bituminous treatment of hard-surfaced roads.

PERSONALS

Black, Ernest, of the consulting engineering firm of Black & Veatch, Kansas City, Mo., has been commissioned captain in the finance division of the aviation section of the Signal Corps, U. S. A., and put in charge of appraisal of property at plants manufacturing airplanes.

Dixon, Dr. Samuel G., state commissioner of health of Pennsylvania, died recently in Philadelphia at the age of 66. Dr. Dixon was appointed commissioner in 1905, at the time the department was created, and was reappointed by succeeding governors. He was graduated from the medical department of the University of Pennsylvania in 1866, and studied in Europe. In 1899 Dr. Dixon became professor of sanitary engineering at the University of Pennsylvania, and in 1890 professor of bacteriology and microscopical technology at the Academy of Natural Sciences in Philadelphia. He was an acknowledged authority on the subject of tuberculosis.

Martin, H. P., for the past four years supervisor of streets of Dayton, O., has been appointed to the position of director of public service, made vacant by the promotion of former director Barlow to the position of manager. H. P. Ullmer, supervising inspector of the street department, has been promoted to the position of supervisor of streets.

McBride, G. G., who has been assistant state engineer of Nevada, is now captain in the ordnance department of the army, on duty at Washington.

Rands, H. A., civil engineer, Portland, Ore., has been placed by the Port of Portland Commission in charge of the traffic survey of the Upper Columbia and Snake Rivers. Mr. Rands will submit his suggestions and reports on the work to the port of Portland's traffic survey committee.

Stevens, Colonel Edwin A., formerly state highway commissioner of New Jersey, died March 8 at Washington, D. C., where he was serving as a shipyard inspector under appointment by President Wilson. Colonel Stevens had held many offices in New Jersey. He was born in Philadelphia on March 14, 1858, and attended Princeton Uni-

(*Continued on page 236.*)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

A G A DANGER SIGNALS.

Acetylene Flashing Devices with Useful Features.

The A G A danger signal, made in a number of forms, including a highway signal and a railway grade crossing signal, is designed as a reliable luminous signal needed in safeguarding dangerous curves, grades or crossings. The A G A signal is calculated to fill the three necessary requirements of such safety service: Character of light is such that it cannot be mistaken for anything but a danger signal; simple construction and automatic operation without attention for long periods; reasonable first cost and lost maintenance charges.

The A G A highway danger signal consists essentially of a post carrying a transparent sign equipped with a red lens through which the light flashes a red warning signal and at the same time illuminates the lettering on the sign with sharp, distinctive flashes. The A G A flash light has proved its reliability under all conditions in hot and cold weather and in dry and damp climates. It is used by the United States Government and European countries for lighthouse service. The flasher designed especially for railroad and highway signal work is on the same principle as the large A G A flashers used for lighthouses and buoys. The A G A flasher produces distinct and characteristic light and dark periods by automatically shutting off and opening the gas outlet to the burner. These short, sharp, powerful flashes provide a signal extremely characteristic, penetrating and conspicuous. The flasher is set for the light characteristic most suitable for this work—1/15 second light and 14/15 second dark, or 60 flashes per minute. The number of flashes per minute, however, can be increased or decreased as desired. Operation is automatic. On account of its construction, simplicity and few moving parts, the light is reliable and durable.

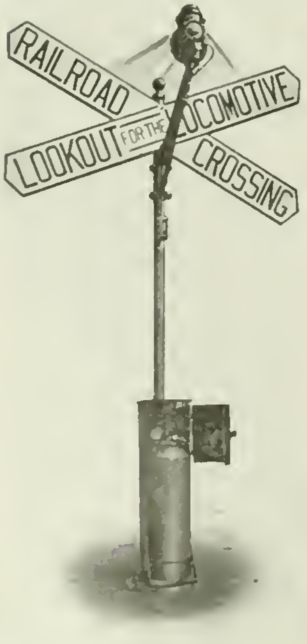
The flashing device operates as follows: The gas is admitted at "A," passes through the passage "B" to the small chamber "C" where it divides and part goes to feed the pilot burner "D," the remainder passing through the passage "E" into the gas chamber "F," as indicated by the arrows. Here the pressure of the gas forces the diaphragm "G" downward until the tension on the lever "H" is such that it is pulled away from its seat "S," when the gas escapes from chamber "F" through passage "I" to the burner "K" where it is ignited by the pilot "D" and the flash produced. The outlet port "S" being considerably larger than the inlet port "E," the pressure on diaphragm "G" is reduced and lever "H" goes back to its original position and the operation is repeated. The end of lever "H" is magnetized so that there is no dragging in the closing or opening of the valve at "S." The frequency of the flasher per minute is regulated by changing the position of frequency level "L."

The illuminant in the A G A system is acetylene, the brilliant white light of which makes it specially suitable for day and night signals for railway and highway purposes. The acetylene is dissolved and stored in seamless, drawn steel containers which are made in two sizes, of 225 and 275 cu. ft. capacity. These containers are tested to a pressure of over 700 pounds to the square inch and the pressure of the gas, even when containers are fully charged, is only a fraction of this.

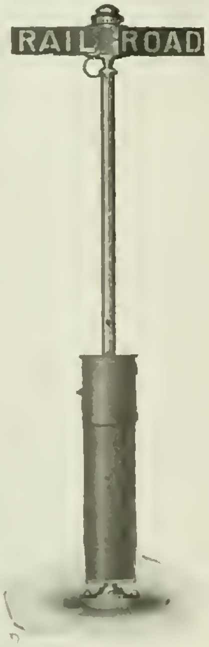
The containers are filled with a substance of about 80 per cent porosity, known as the A G A porous mass. This mass is saturated with acetone, a liquid possessing the property of being able to dissolve or absorb 250 times its own volume of acetylene at a pressure of ten atmospheres. As the containers are charged with a quantity of acetone amounting to 40 per cent of their own volume, these containers will store 100 times their own volume of acetylene when charged to a pressure of 10 atmospheres or 150 pounds.

For the A G A highway danger signal a container 12 inches by 36 inches is used, which when fully charged contains 225 cubic feet of gas and weighs 225 pounds, when empty it weighs 210 pounds. The highway danger signal lamp is 5 feet long and 9½ inches high.

A G A DANGER SIGNALS



GRADE CROSSING SIGNAL.



HIGHWAY SIGNAL.

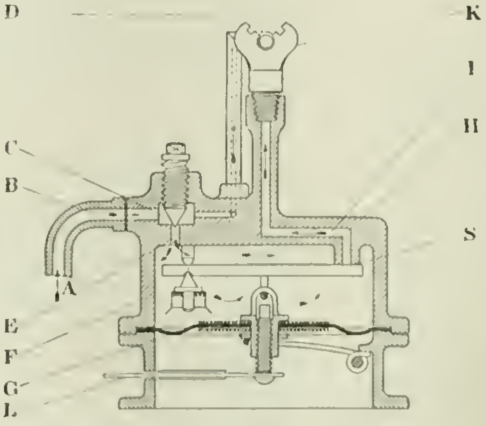


DIAGRAM OF MECHANISM FOR FLASHING.

HIGHWAY SIGNAL.

The flasher, which is located in the center, illuminates the transparent lettering, which is 8 inches high on the sides, and at the same time produces the flashes. In the highway danger signals the posts are of 3-inch wrought iron pipe. The focal height of light above the ground in both types is twelve feet, but it can be made to suit requirements. The lamp is bolted to the top of the post or bracket and the container is placed at the base of the structure as shown in the illustrations. The lettering on the lamp can be altered as desired.

On account of the small gas consumption of the A G A signals, and the moderate cost of gas, these lights are generally allowed to burn night and day. The following figures indicate the cost of maintaining one of the highway danger signals: With a light characteristic of 1/15 seconds light and 14/15 seconds dark, or 60 flashes per minute the burner alone consumes 0.28 cu. ft. of gas per day. To this is added 0.33 cu. ft. consumed by the pilot-flames giving a total daily gas consumption of approximately 0.6 cu. ft., thus:

Container	Capacity of Container	Gas Consumed, 24 Hours	Will Run on One Charge
12" x 36"	225 cu. ft.	.6 cu. ft.	300 days.
12" x 44"	275 cu. ft.	.6 cu. ft.	365 days.

In these figures a liberal allowance is made for reserve gas, to take care of temperature changes. Containers may be recharged with gas at the following charging plants: Atlanta, Ga.; Bound Brook, N. J.; Moberly, Mo.; Aurora, Ill.; East Deerfield, Mass.; San Francisco, Cal., and Toronto, Canada.

The grade crossing signal is operated on the same general principle. In the railway grade crossing signal also, the 12 inch by 36 inch container is used. The acetylene container, pressure gauge, pressure regulator and high pressure piping are protected in a sheet-iron housing. The housing is fastened by iron clamps to the base of the post supporting the crossing danger sign. At the top of the housing a door is provided which can be securely locked, thus protecting its contents from meddlesome trespassers. The base of the housing is arranged so that the container cannot be removed without first unlocking the door. The total weight of the equipment is about 400 pounds.

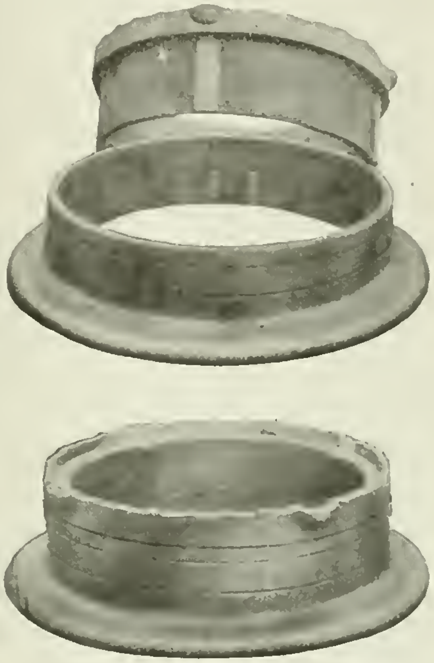
The lamp, however, is not set in the sign, but in front of it, illuminating the lettering on the arms with a white light and flashing a red light in the opposite direction. This may be had with an electric magnet, which in case of disarrangement in either track or local circuit, is released and causes the flasher to operate instantly providing a light on the side of safety. Without this magnet, the flasher operates continuously.

The illustrations show the straight post and bracket type highway signals, the grade crossing signal and a diagram of the flashing device. These signals are made by the A G A Railway Light & Signal Co., Elizabeth, N. J.

ADJUSTABLE MANHOLE FRAME.

Of New Design to Allow for Changing Street Surface.

City engineers and other officials in charge of street construction and maintenance have long realized that manhole structures are an important factor in the condition of the street surface. Officials having control of sewers and other conduits having manholes have found that the character of the street surface affects the safety and life of the manhole frames and covers. Where a manhole cover is higher than the surrounding pavement, the continuous impact of vehicle wheels coming down from the cover, tends to injure the pavement, forming a focus for wearing. The protrusion of the cover itself spoils the surface. On the other hand, there is a danger that a particularly heavy vehicle may break the frame and cover if they are exposed. A structure so placed is always subject to uneven and unnecessary wear.


DANIELS ADJUSTABLE MANHOLE FRAME.

These considerations, involving both the usefulness of the pavement and that of the manhole structure, have led to the design and development of the Daniels adjustable, collapsible manhole frame. This is so constructed that the frame may be lowered so as to be in proper relation to the changing street surface, without disturbing road materials.

The manhole is also a source and subject of difficulty during change of grade, paving construction or repairing, or resurfacing.

This frame consists essentially of two parts, separated by rings, the number of which may be varied to change the height. The upper member of the frame is made to telescope with the lower portion. A part of the retaining wall is made of the solid iron rings, having the same circumference as both the lower section and the upper flange where the covers rest, which are inserted between the upper flange and the lower member. The upper section of the frame may be lifted, a ring removed and the frame replaced, occupying the space left by the ring.

The traffic load is carried by the rings. The grooves between the telescoping members secure rigidity sufficient to prevent canting or tipping of the upper member. The ribs on the outside of the top member sustain the demountable wall against any crowding of the road material. At the time of rebuilding the street all the rings are returned and the top of the frame is at its original level.

Two rings are placed in the recess, one one inch and the other two inches wide—giving three inches (one inch at a time) of range of adjustment. Rings of lesser width may be used.

The frame is made for a standard cover 24 inches in diameter with a clear opening of 22 inches for a ladder or basket. The two frame pieces weigh from 260 to 275 pounds, not including the cover. The two rings weigh about 50 pounds.

The accompanying illustration shows two views of the frame—one as it appears put together and one showing the upper section lifted. This frame is made by the Daniels Road Oiling Company, 171 Westchester street, Providence, R. I.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is a tendency to cut about $2 a ton on 6-inch and $1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

The Trussed Concrete Steel Company, Youngstown, O., has changed its name to the Truscon Steel Company. In its early days, years ago, the company devoted itself exclusively to reinforced concrete, introducing many new reinforcing products such as the Kahn Bar, Floretyles, etc. For many years, however, the activities of this organization have expanded far beyond the concrete field so as to include a large variety of steel products. Prominent among these might be mentioned the steel windows so widely used in building work, metal lath, pressed steel joists, all-steel buildings, inserts and other specialties. In the highway field the company is favorably known for Kahn armor plates, installing devices, road mesh and curb bars for concrete pavements.

In selecting a name embracing all its present activities the company follows the trend of popular suggestion. For years the company has been generally known by the name "Truscon"—a simplified abbreviation of the longer name. For this reason "Truscon Steel Company" has been selected as the new name of the company. Aside from this simplification of the name of the Truscon Steel Company, there has been absolutely no change in the company, its organization or management in any way. Representatives, locations and everything about the company are identically the same. The plant and general sales offices are at Youngstown, Ohio, and the company has representatives in principal cities.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., has recently secured the services of G. W. Bichlmeir, who prior to his association with the Zelnicker Company was connected with the supply departments of the Missouri Pacific and Kansas City Southern Railway Companies, as well as having been secretary-treasurer of the W. L. Sullivan Machinery Company. Mr. Bichlmeier is connected with the Zelnicker machinery department.

The Permutit Company, manufacturing water softening and water rectification apparatus and for several years past located at 30 East 42nd street, New York, announces its removal to 440 Fourth avenue, New York, where after March 15 the entire top floor will be occupied by its offices.

Raising Hogs on City Garbage.

The National Serum Co., So. St. Paul, Minn., whose business primarily is the making of anti-hog-cholera serum, has gone into the business of raising hogs, having contracts with the cities of St. Paul, Minn., and Waterloo, Ia.; also several feeding stations outside of Minneapolis, from which town it buys the garbage after it has been delivered to the incinerating plant. The city of St. Paul collects the residence garbage and delivers it to the hog farm at a certain price per ton. The company also has a number of other feeding stations near St. Paul, in which it uses garbage bought direct from hotels and restaurants.

The price that the company pays for garbage depends upon its quality and length of its contract. Waterloo receives the highest price for its garbage because it has given the company a five-year contract and delivers at the feeding pens all of the garbage of the residence district and of the hotels and restaurants. The United Disposal and Recovery Co., of Chicago, which has an arrangement with the city for collecting garbage in Chicago, will deliver it to feeding pens where hogs will be furnished and cared for by the National Serum Co., the two companies dividing the profits.

The company states that its success in raising hogs on city garbage is due to experience in determining the quality of garbage used for food and maintaining the sanitary conditions in both feeding pens and sleeping-quarters. It states that no public market has made any discrimination between corn-fed hogs and those raised by this company. The company is open at all times to form contracts with any city having a population of 35,000 or more.

Manufacturers' Motor Truck Committee Aids Government.

With a view to aiding the Government in breaking the present nation-wide freight congestion, a Motor Truck Committee of the National Automobile Chamber of Commerce has been appointed for constant service in Washington. Christian Girl, director of production, Military Truck Division, Quartermaster Corps, U. S. A.; Hugh Chalmers, Automobile Industries Committee, and Roy D. Chapin, chairman, Highways Transport Committee, explained at the recent convention of motor truck manufacturers in New York that the importance of the motor truck was constantly increasing, not only as a war factor, but as a great and immediately available means for dealing with the freight congestion. The committee as organized includes George M. Graham, Pierce-Arrow Motor Car Company, chairman; Windsor T. White, president of the White Company; M. L. Pulcher, general manager of the Federal Motor Truck Company; David Ludlum, president of the Autocar Company, and D. C. Fenner, Mack Motor Truck Company. This committee will work largely with the Highways Transport Committee, which has charge of the responsible task of diverting short-haul traffic from railroads to the highways to relieve railroad and terminal congestion and restore normal distribution. It will also be available to all other departments of the Council of National Defense or of the War Department for any service it may be able to render, and will give to manufacturers of motor trucks all over the United States such assistance as they may call for. Temporary headquarters have been taken in the Ouray Building, Eighth and G streets, N. W., Washington, D. C.

PERSONALS

(Continued from page 233.)

versity, from which he was graduated with the degree of A. B. in 1879. Then he took a course in the Stevens Institute of Technology, graduating as an engineer. He served as park commissioner and tax commissioner, and was also one of the commissioners who settled the long standing boundary dispute between the states of New York and New Jersey. He was also very active in state military affairs. He was appointed Commissioner of Public Roads in 1911 by President Wilson, when the latter was Governor of New Jersey. The Bergen, the first screw propeller ferryboat, was designed by Colonel Stevens. This vessel is still in commission, and operates between Hoboken and New York. That invention marked a distinctive departure in the construction of such vessels, and one which proved so satisfactory that all other ferry lines adopted the patent. Many other inventions of a mechanical nature are to his credit. In 1910 Colonel Stevens placed his property and business in the hands of trustees, arranging that he should receive an income of not less than $3,600 a year and not more than $6,000, and making provision for different members of his family. A litle more than a year ago Colonel Stevens was appointed a member of the state highway commission by Governor Edge. He gave up the duties of this office when he was called to Washington.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Roseville, Cal., is to construct a BRIDGE, plans for the structure being in course of preparation by the engineer, A. Girvan.

A SEWERAGE SYSTEM is to be built by Porterdale, Ga. Plans for the improvement have been completed by the J. B. McCrary Co.

Blythe, Cal., is to construct SEWERAGE and WATER SYSTEMS. A. P. Campbell is the engineer chosen to prepare plans for the improvement.

A WATER SUPPLY SYSTEM is to be built by De Witt, Ill., from plans to be prepared by the engineer engaged, W. D. Warren.

Norfolk County, Braintree, Mass., is to construct APPROACHES to a BRIDGE. The consulting engineers for the work are the firm of J. R. Worcester & Co.

A new WELL is soon to be drilled by Eudora, Ark. The consulting engineer for the work is Xavier A. Kramer.

STREET IMPROVEMENTS are to be made by Tracy, Minn. The engineer for the work is John W. Shaffer.

Houston County, Caledonia, Minn., is building three BRIDGES and rebuilding one. The engineer for the improvements is G. A. Ralph.

Meadville, Pa., is to build a SEWAGE DISPOSAL PLANT, and has retained the engineering firm of Chester & Fleming to prepare plans and specifications for the improvement.

Millard County, Deseret, and Sevier County, Monroe, Utah, are to make extensive DRAINAGE IMPROVEMENTS. The engineers for the projects are the firm of Caldwell & Richards.

Municipal Journal

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CHLORINATION AT SAN DIEGO*

Liquid Chlorine Entirely Eliminates Colon Bacillus from Water Supply—No Typhoid Traceable to Supply—Difficulties Experienced in Applying Chlorine to Water Supply and Methods of Overcoming Them.

By WILBUR H. JUDY.†

The increasing use of liquid chlorine as a sterilizing agent for water supply will doubtless develop many interesting problems according to varying local conditions to be met in the different plants. As there seems to be more or less trouble encountered with nearly evry sterilizing apparatus installation, it may be interesting to note some difficulties which developed in the chlorination plant of the city of San Diego, California, the methods used to overcome them and the results obtained.

The first chlorinator installed by the city was a solution feed machine to operate against a back pressure of twenty-five pounds maximum. This machine was located to inject chlorine solution into the effluent from pressure filters and had a rated capacity of thirty ounces of chlorine per hour. Considerable trouble developed in the check valve, which allowed water to back up into the control plate. Each time this happened the apparatus was taken down and thoroughly dried out. One of the main sources of check-valve trouble was filter washing, which caused a surge in the effluent main that increased the pressure several pounds.

A second chlorinator, duplicate of the first except that it is a gravity feed plant, was installed at a small reservoir in the city to treat water pumped from the San Diego river in cases of emergencies. This plant can also be used to chlorinate water from the impounding system when the consumption is low. By the use of this plant, when the first one at Otay was out of order, a standard certifiable water was delivered to consumers.

As the gravity feed plant gave excellent service with practically no trouble, it was decided to change the pressure plant at Otay into a gravity feed type. To overcome the back pressure in the effluent main, it was necessary to have the plant at an elevation of at least sixty feet higher than the main. This was obtained by moving the plant to a point on the hill back of the filter house. (Plant layout shown in Fig. 2.)

After installing the apparatus in the new location and operating for a few days, the bacteriological analyses began to give erratic results, showing faulty operation of the chlorinator. Upon careful examination, the theory was advanced that during filter washing the fluctuation in effluent pressure caused an intermittent flow of chlorine solution. As the chlorine solution fed by gravity, the solution column height in the one-inch rubber main was governed by the effluent pressure. During filter washing, as the effluent pressure dropped, the solution column lowered correspondingly, and again when the effluent pressure increased the solution column would back up to a height corresponding to the pressure increase. In this manner an intermittent flow of solution was injected into the effluent main. To prove this theory a series of samples was taken at a point about 500 feet from the point of solution injection. From the rate of flow at the time of sampling, a calculation was made of the time required for water to flow from the point of chlorination to the sampling cock. Sample A was taken before washing was started, B, C, and E were taken during times theoretically unchlorinated water was passing, and sample D was taken during a time theoretically treated water was passing. The analyses of these samples proved the theory to be correct (see table I). Consequently a device was designed to regulate the solution feed. The device does not actually regulate the solution feed, but merely insures a positive flow in the solution main at all times.

The regulator, Fig. 1, consists simply of a small wooden tank, 10 inches by 10 inches by 3 feet, connected at the top with the high-pressure, fresh-water service, the flow of water being regulated by a float and ball cock. The bottom of this tank is connected with the chlorine solution main, by means of rubber pipe and fittings, at a point just outside of the chlorine house. Between filter washings the water level in the tank is governed by the position of the rubber cock, Fig. 1, which is on the discharge end of the solution main above the effluent pipe. The position of the cock varies according to the flow in the effluent. A large flow produces a high back-pressure, thus requiring a larger opening of the cock to keep the water in the regulating tank at point "A" than do a lower flow and smaller back-pressure.

With the cock set at point 4 (for about a ten-million-gallon flow) and the tank water level at "A," filter washing is started. The pressure in the effluent main drops about eight pounds in five minutes, which causes an increased flow in the solution main. As the flow of water into the absorption tower must remain constant, the increase in flow is taken care of by the fresh water tank float, which opens the ball cock as soon as the flow increases enough to lower the water level in the tank. In this way the head on the solution main never varies more than from "A" to "B," one inch. When the wash-water pump is stopped and the unit cut back into service, the effluent pressure increases eight or ten pounds in five minutes, but as the head on the solution main remains practically constant during washing there is a positive flow of solution at all times.

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*For information concerning this plant, see Municipal Journal for November 30, 1916, and March 29, 1917.

†Engineer, Operating Department, San Diego, Cal.

Theoretically this device is not perfect, because during increased flow in the solution main fresh water is added to the solution from the absorption tower, thus partially filling the rubber main with a weaker solution, which is discharged during the pressure increase in the effluent main. Practically, however, it has proven to be very efficient because it has overcome the problem of continuous flow from the solution main during all stages of filter washing.

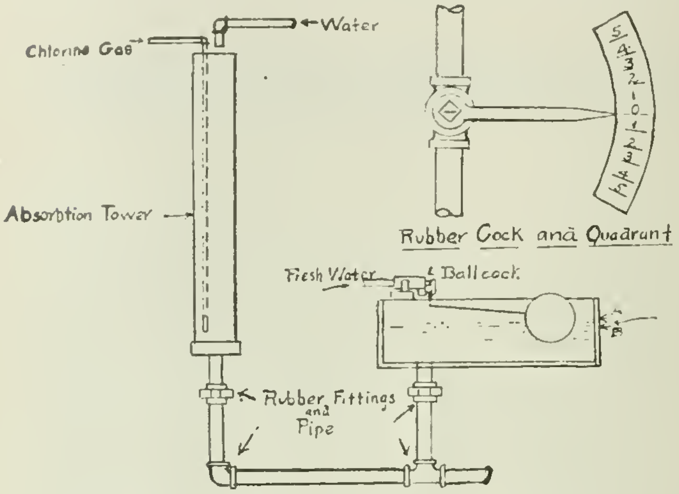


FIG. 1.—DETAILS OF SOLUTION FEED REGULATOR.

Table I gives the results of bacteriological analyses of samples taken in two series, one before the device was installed and the other after the installation. The first series, A, B, C, D and E, was taken before, and the second series, A', B', C', D' and E', was taken after the installation of the regulator. Both series were taken at the same relative periods of filter washings as marked on the pressure curve. Samples A and A' were taken before washing was started in each case.

TABLE I.

Sample	A	A'	B	B'	C	C'	D	D'	E	E'
Total count......	17	4	1230	7	560	4	26	4	2250	6
B. Coli in .1 cc	–	–	–	–	–	–	–	–	+	–
B. Coli in 1.0 cc	–	–	–	–	+	–	–	–	+	–
B. Coli in 10.0 cc	–	–	–	–	+	–	+	–	+	–

These results show the effectiveness of the device and furthermore, at the time of writing, the first month of 1918 has passed without any signs of B. coli in the water as delivered to consumers and with an average total count of 16. Another important feature is the fact that, since the installation of the device, the chlorine feed has been reduced from four pounds to two pounds per million gallons of water.

It is also interesting to note that during the year 1917 there were 57 cases of typhoid in the city of San Diego, 42 of which were directly traceable to contaminated oysters and the remaining 15 cases were imported, none being traceable to water.

SEWAGE POLLUTION OF BOSTON HARBOR

Report of State Commission Shows Gradual Increase —Acid Treatment of Sewage Not Recommended, Chiefly for Financial Reasons.

Last year a joint committee was appointed by the General Court of Massachusetts, to report upon the pollution of Boston Harbor by sewage discharged into it, and "whether there is any practical, economical way of removing from the sewage any merchantable products contained therein." This committee, consisting of the chairman of the Metropolitan Water & Sewerage Board, the state health commissioner, and the commissioner of Public Works of Boston, has made its report, the general facts and conclusions of which are given below.

There are three principal sewage outlets into Boston Harbor, in addition to small local sewers and sewage brought in by streams. These three outlets have been in operation for a number of years, but the one which formerly discharged at low-water level near Deer Island light has been extended to deep water and the sewage is now discharged at 14 different outlets from a conduit extending for a distance of 126 feet along the bottom of the sea at depths of from 32 to 53 feet at low-tide, the outlets being located in a line at right angles to the strong tidal current that passes this point. This new outlet was first put into service in November, 1917, and full information as to the change in conditions effected by it has not been obtained, but such as is available indicates a very great improvement. The sewage that is received at the Calf Pasture pumping station is pumped to settling tanks, then passes through an inverted siphon under Dorchester bay to reservoirs at Moon Island, where it is stored during the incoming tide and discharged during the second and third hours of the outgoing tide. By the time it is discharged, this sewage is so stale that it has become very much decomposed and putrefied, with a resulting more offensive odor. The discharge at this outlet on calm days in summer covers 600 to 700 acres of the harbor surface, while a thin film of oily sleek extends to greater distances.

A considerable pollution of the harbor undoubtedly is caused by storm overflows from combined sewers, at most of which outletes sewage overflows during every considerable storm, and from many of which there is also considerable leakage. Change from the combined to the separate system of carrying sewage and storm water has already been begun in parts of the district tribu-

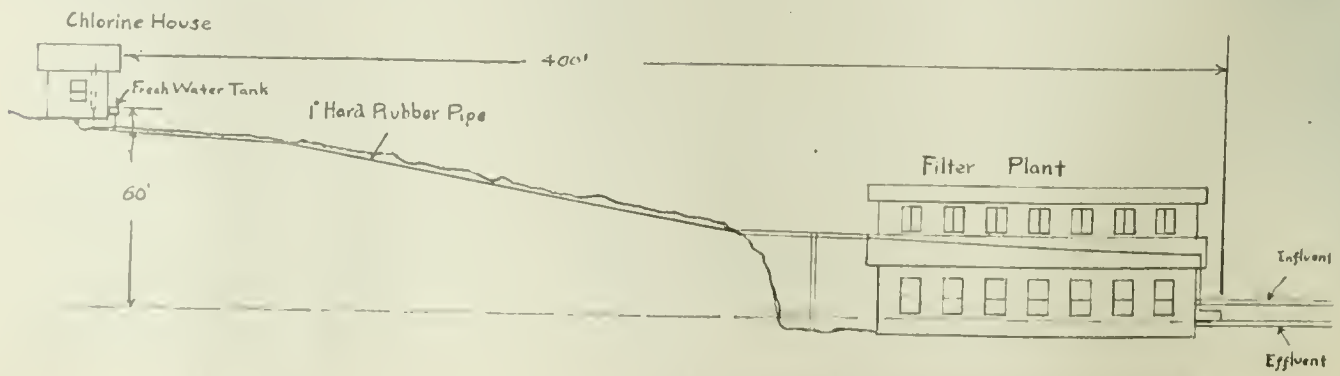


FIG. 2.—LAYOUT OF FILTER HOUSE AND CHLORINE HOUSE, AFTER MOVING LATTER.

tary to the harbor and will, if continued, eventually remove this source of pollution.

The condition of the harbor due to sewage discharge at Moon island is believed to have changed but little since the 1915 report of the State Department of Health, although at this, as at every outlet, the amount of polluting matter has increased. The Deer island outlet has already been referred to. The third outlet at Nut island discharges through two outfall sewers, one terminating one mile north of the island and the other 1,500 feet east of it; the former in 27 feet of water and the latter in 30 feet. Analyses of ammonias in water taken at various points show that, except within a distance of about 1,400 feet from the outlet, the quantity of free and albuminoid ammonia in the water at the surface and at points 20 feet below the surface is no greater than is found in the harbor waters at points far removed from sewer outlets.

Ammonia analyses of water taken at various points in the harbor during 1913 were compared by the committee with similar analyses taken in 1905; and this showed that during the intervening eight years the amount of free ammonia in the inner harbor during ebb-tide had increased from 0.34 parts per million to 0.43, and during the flood-tide from 0.25 to 0.41. The amount of pollution decreased with the distance from the inner harbor, and in the outer harbor the free ammonia found during the two years in question was 0.11 and 0.18 respectively on the ebb-tide and 0.06 and 0.10 on the flood. While conditions do not appear to have reached a serious stage in the harbor as yet, and while the increase in ammonia has not been great, it nevertheless appears that the growing population about the shores of the harbor is having an increased effect upon quality of the water.

ACID TREATMENT OF SEWAGE.

More up-to-date and more interesting was the report of the committee with regard to the removal of merchantable products from the sewage. Concerning this, the committee reported:

"Normal domestic sewage of average strength contains, speaking broadly, a considerable amount of fatty matter and nitrogen and a small amount of potash. The recovery of these materials by a method which would be commercially successful has long been desired and actively and persistently sought by expert chemists and engineers in England, France and Germany, and to some extent in this country. Up to the present time, however, no process has been found that would adequately and satisfactorily solve this problem unless during the present war workers in Germany along these lines, in their efforts to save and supply grease to the country, have perfected such a process. Of this we have no knowledge, however.

"Studies of the literature on the subject, and correspondence during the past year with prominent English engineers and chemists having charge of large municipal works for the disposal of sewage much richer in valuable constituents than that emptied into Boston Harbor, have shown that at only a few places in England is any attempt made to recover grease from domestic sewage, and at none is it as yet an assured commercial success. At Bradford, Leeds, Huddersfield, Oldham, Norwich and other places in England plants are operated for the recovery of grease and sludge-cake from the municipal sewage, but at most or all of these cities this sewage contains wastes from wool-scouring establishments. The practical results of each are probably fairly summarized in a statement from the Leeds authorities, as follows:

"Progress already made in this direction shows that in time it will be possible by artificial processes to get rid of all sludge without causing any nuisance, and make sufficient by the sale of by-products at least to pay the full cost of disposal.

"In Germany, before the war, the various plants erected for this purpose had one after the other been pronounced failures and abandoned. Moreover, when we consider the extreme reluctance of woolen manufacturers, wool-scourers, etc., up to the present time of scarcity of grease and potash, to erect plants for the recovery of these matters undoubtedly present in large amounts in waste wool-scouring liquor, the commercial failure of plants for their recovery from domestic sewage is not to be wondered at.

"For many years the State Department of Health has made studies of wool-scouring waste in Massachusetts and of its valuable constituents, and has also made studies in regard to the fatty matters, nitrogen, etc., in domestic sewage, and in regard to the recovery of these matters from each liquor. Observation in regard to wool scouring wastes, especially during the past ten years, have been made at many of the plants in the state where wool is scoured, but the most complete studies by the department have been made at Lawrence. At Lawrence approximately from 75,000,000 to 100,000,000 pounds of wool are scoured in a normal year's operation of the mills.

"In 1910, 1911 and 1912 the State Department of Health made, by direction of the Legislature, extensive studies of the sanitary condition of the Merrimack river, and this study included many measurements of the volume of waste wool liquor produced at Lawrence and entering this river, and a large amount of analytical work to determine the character of these wastes, especially as to the amount of grease, potash and nitrogen present. The results of these studies were given in a report (House, No. 2050) made in 1913, entitled 'Report of the State Board of Health upon the Sanitary Condition of the Merrimack River.'

A table is given in the report that shows the volume per day of wool-scouring liquor, etc., entering the Merrimack river at Lawrence, and the amounts of fats, nitrogen, and potash present in this liquor.

"The table shows that in 1910, for example, the average volume of output from the first and second bowls of the wool-scouring machines at all of the wool-scouring plants of the city amounted to 211,000 gallons a day and that this volume of liquor contained on an average 29,000 pounds of fatty matters, 14,000 pounds of potash and 2,200 pounds of nitrogen; that is, each gallon of liquor contined .14 pound of fats, .07 pound of potash and .01 pound of nitrogen. Notwithstanding the large amount of valuable materials found in this liquor, however, the department was not able at that time to persuade the manufacturing concerns of the city to erect a suitable plant or plants for the recovery of these matters.

"At the present time, as there is only a small available supply of potash and grease in the country on account of the war, and because of the greatly enhanced price of each, two companies from outside the city are taking the richest wastes from nearly all the mill plants in Lawrence, and we are informed are making some profit. Plants for the recovery of grease from wool waste are also in successful operation at three or four other places in Massachusetts.

"One of the companies at Lawrence recovers both fatty matters and potash, while the plants of the other company are constructed to recover fatty matters only, these fatty matters being worked up into lanolin, etc. These various recovery plants treat approximately 2,000,000 gallons of the richest wastes each month, or about 80,000 gallons a day, taking, however, only the wastes from the first bowl of each wool-scouring plant. It might be said here that in the scouring of wool, the wool moves in one direction through a set of bowls containing the cleansing liquors, and the liquor in the other direction, so that the first bowl in which the wool is first immersed contains always the strongest liquor: that is, the liquor containing the most fats, potash, nitrogen, etc."

During 1917, work was carried on to ascertain the amounts of fatty matters, nitrogen, etc., in the sewage entering the harbor from the three outlets. Experiments were conducted to determine the total average volume of sludge and fatty matters settling out from the sewage in a few hours under normal conditions, and also the volume of such matters settling out when the sewage was acidified by means of SO_2 (the Miles acid process).

The amount of fatty matters varied from an average of 226 pounds per million gallons in the sewage from Peddock's Island outlet to 541 pounds in that from Deer Island light; the nitrogen ranging from an average of 27 pounds in the former to 52 pounds in the latter. These were the amounts found when the sewage was acidified with 818 and 1,513 pounds of SO_2 per million gallons, respectively; which amount of sewage was in excess of the amounts actually required for the reaction desired. Potash was found in the sewage in only negligible quantities and could not be recovered. These showed that while the Lawrence wool-scouring liquor contained per gallon 0.14 pound of fatty matter, 0.07 of potash and 0.01 of nitrogen, the strongest Boston sewage contained 0.0006 pound of fatty matter, a very small amount of organic nitrogen and practically no potash.

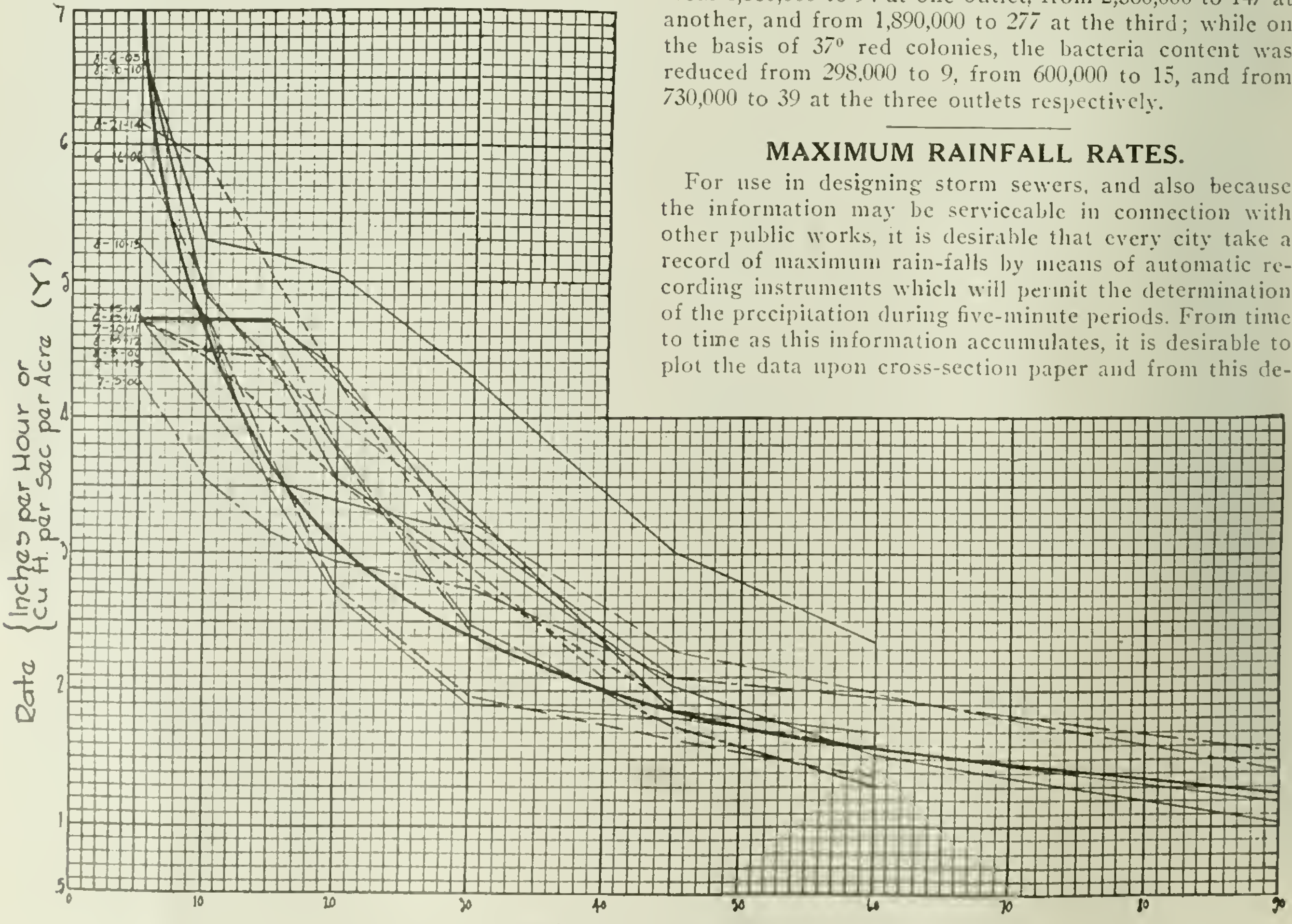
Without attempting to criticise the figures given by Robt. Spurr Weston and E. S. Dorr concerning cost of erecting and operating a plant for carrying on the Miles acid process, the committee states that these figures were based on estimates and not upon any actual data from construction of plants for the treatment of domestic sewage or the cost of operation of such plants. Taking into consideration, however, "the commercial failure of practically all plants abroad when constructed and operated for the purpose of recovering valuable materials from domestic sewage, and the great reluctance with which manufacturers enter into the business of recovering such materials from rich wool-scouring liquor containing probably at the least estimate 400 times as much of value as domestic sewage," the committee did not feel justified in recommending that this process be adopted by Boston or the metropolitan sewerage district. "Extended experiments and investigations on a large and practical scale would first be necessary for the accumulation of any reliable data in regard to outlay in construction, cost of operation and income to be obtained from such works."

Another argument offered in favor of the Miles acid process is the greatly improved character of the effluent. Regarding this, the committee concluded from its experiments that, while organic matter in the sewage can be reduced from 30 to 40 per cent by the acid treatment, it is reduced to almost the same extent by sedimentation without the use of acid. Seventy-five per cent as much sludge and fatty matters were obtained by sedimentation alone as by acidification followed by sedimentation. "The question naturally arises, then, is it worth while to spend approximately $6 for SO_2 for each ton of sludge produced, if this increases the amount of sludge and grease only 25 per cent. Acidification of the concentrated sludge at a much smaller cost could be carried on in order to crack the grease for recovery."

There undoubtedly was a very great improvement from the point of view of bacterial content. On the basis of 20° bacteria, acidification reduced the bacteria content from 1,860,000 to 94 at one outlet, from 2,360,000 to 147 at another, and from 1,890,000 to 277 at the third; while on the basis of 37° red colonies, the bacteria content was reduced from 298,000 to 9, from 600,000 to 15, and from 730,000 to 39 at the three outlets respectively.

MAXIMUM RAINFALL RATES.

For use in designing storm sewers, and also because the information may be serviceable in connection with other public works, it is desirable that every city take a record of maximum rain-falls by means of automatic recording instruments which will permit the determination of the precipitation during five-minute periods. From time to time as this information accumulates, it is desirable to plot the data upon cross-section paper and from this de-



RELATION BETWEEN INTENSITY AND DURATION OF RAINFALL.

Curves show the 13 most severe storms during the years 1905 to 1914.

termine a rain-fall curve which can be used for determining the maximum rate of precipitation which needs to be considered for any given period of time. Most of the large cities have done this.

In the annual report of the Bureau of Surveys of Philadelphia is given such a curve derived from the records of that city. Since 1895 there have been maintained in the city six pluviometer stations located in the central, south, west, northwest, north and northeast sections, each of which contains an automatic recording instrument. In preparing the curve, shown herewith, the records for a period of ten years, from 1905 to 1914 inclusive, were investigated. All storms showing a five-minute intensity equivalent to a rain-fall at the rate of one inch or more per hour were selected.

During this period, 138 storms furnished this minimum intensity and the actual intensities for 5, 10, 15, 20, 30, 45, 60, 90, 120, and 180 minutes were plotted and tabulated. The tabulated intensities were then examined for the highest value in each time interval, and this was listed as possible. Similarly, possible storms occurring 2, 3, etc., to 10 times in 10 years, were selected.

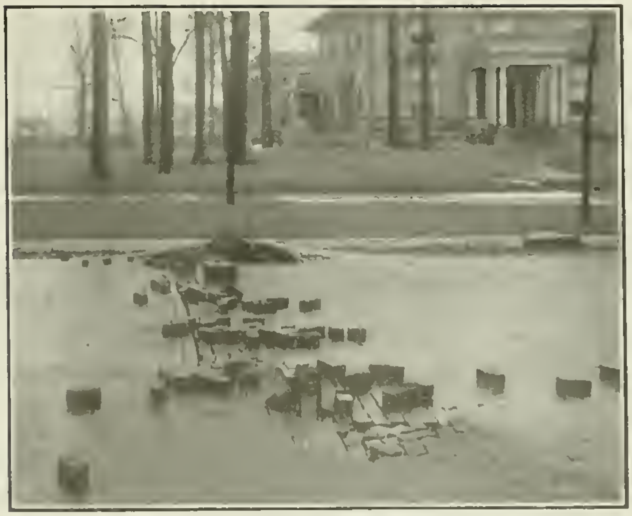
Giving due consideration to both safety and economy, it was decided to select, as a basis for sewage designing, the maximum storm performance that occurred ten times in ten years. The time-interval intensities of this tenth-rate storm were plotted, and a curve cutting 7 or 8 points approximated a parabola. A formula for the true parabola that would most nearly coincide with the plotted points was then worked out, the formula being $Y=18.5X^{-0.6}$. This curve is shown by the heavy line in the diagram.

WOOD BLOCK PAVEMENT ON WASHINGTON BOULEVARD

Swelling of Blocks and Bulging Therefrom After Several Years of Service—Author Believes Character of Oil Used Was Responsible.

By CHARLES C. BROWN.

The effect of the material used in treating the blocks for use in a wood block pavement upon the pavement during its life and upon the length of life is shown by the history of the pavement on Washington Boulevard, Indianapolis, Ind.

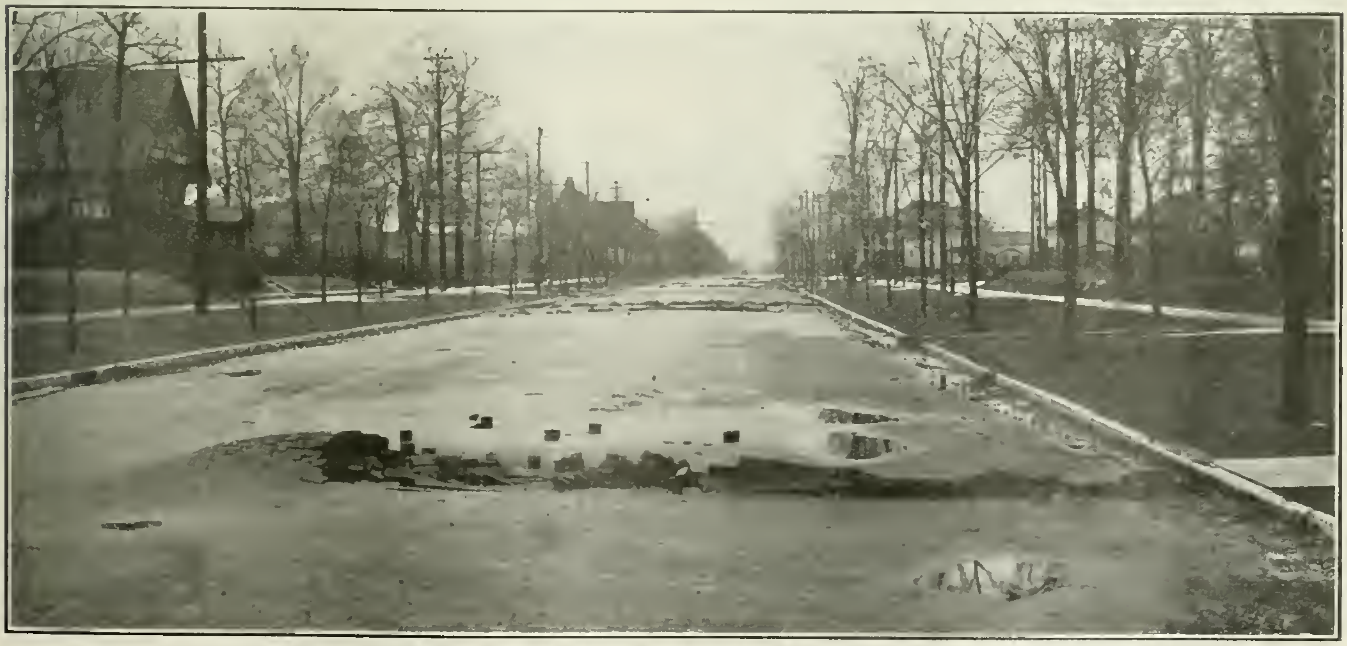


NEAR VIEW OF ONE OF THE BREAKS.

As may be seen from the accompanying photographs, the boulevard is a handsome driveway with wide pavement and lawns with a double row of trees on each side, through one of the newer and first-class residence districts of the city. It is used, when possible, by a large proportion of the pleasure drivers of the city and is one of the streets shown specially to visitors.

To make the pavement suit the surroundings and the traffic, wood block was selected as most satisfactory to the property owners and the city officials, but the history of the pavement has been unfortunate. The reasons for the defects have been studied and shown to be due to the material used in the treatment of the blocks.

The specifications for the street provided for injection into the blocks of 20 lbs. per cu. ft. of a mixture of creosote oil and coal tar. The experiments made under the U. S. Forestry Department and observation of blocks by experts have shown that, especially with so large a quantity of the injected fluid, a large proportion of the mixture remains very near the surfaces of the blocks at the ends of the fibers, which would be the top and bottom surfaces of the blocks as laid in the street. A certain amount of the mixture sticks to the surface and does not enter the blocks, but in the commercial treatment of the blocks is weighed in as a part of the material supposed to be injected into the blocks.



WASHINGTON BOULEVARD, SHOWING BULGING AND RUPTURING OF PAVEMENT.

The failure of the tar mixture to enter the blocks is attributed to various causes and seems to be due particularly to the fact that the tar cannot become fluid enough to enter the capillary voids in the fibers of the timber in the manner possible to creosote and other oils distilled from coal tar. The free carbon and more viscous constituents in the tar, left in the still when the oils proper for treating paving blocks are distilled off, cannot be forced into the minute voids of the wood. The penetrating oils may in part enter the fibers of the wood, but are in part prevented from entering by their mixture with the more viscous substances mentioned. The temperature of the treatment is limited by the ability of the wood to withstand high temperatures and limits the possibilities of producing greater fluidity by adding heat.

When blocks in this condition are laid in the street they are very likely to have a viscid film on the surface, and when the temperature increases under summer heat this film becomes sticky. At the same time the tarry mixture near the surface of the block expands under the heat and exudes upon the surface. This exudation is also sticky at the temperatures reached on the street surface, and soon the street shows the phenomenon called bleeding.

This description of what may be expected is exactly filled by the early history of the pavement on Washington Boulevard. During the hot weather of the first summers of its life, the residents at times could not bring their automobiles in over the street, and for pedestrians to cross the street it was necessary to lay planks to keep them out of the sea of tar.

This condition of affairs lasted for about three years. It is evident that the tar which exuded from the blocks could not get back into them, but was carried away in one way or another. It is also evident that when the expansion of the tar took place, the tar could not expand back into the block, both because the tar got as far into the block as it could when subjected to the comparatively high temperature and pressure during the treatment of the blocks and because the expansion of oil, air, or whatever was in the inner pores of the wood, acted to force the tar out rather than help it go farther in. Moreover, any drying out of possible moisture in the blocks would cause the cell walls of the wood fiber to contract and thus tend to force out any material which might have entered the cells. In the course of time, therefore, the successive expansions of the tar mixture would force out of the blocks most of the tar. In this case, as in many others, the bleeding stopped after about three years, or rather became very slight and unobjectionable.

The effects of the bleeding could be counteracted by proper treatment of the street by sanding, scraping when necessary, or other method suited to the special case, and this has been recommended and might serve as a palliative were there not an even more serious after effect.

For a number of years the pavement gave no particular trouble and remained in good condition with little cost for maintenance. The purpose of the 20-lb. treatment was apparently to make the blocks waterproof, and so long as the pores of the wood near the surface were filled with the tar mixture they were practically so, although the voids in the inner parts of the blocks were far from full of the injected material and far from being waterproofed. When the tar had left the blocks, through the successive expansions from year to year, the waterproofing was reduced in effectiveness, and after some years of the same action, less pronounced than during the first three years but still evident on close inspection at high summer temperatures, the wood fibers were left exposed to the action of water. When the waterproofing near the surface was removed by the process described, the whole interior of the blocks, only slightly filled during the original treatment, was left open to the action of water, and it required only a special occasion, such as comes nearly every year and sometimes several times in a year, to subject the pavement to the maximum effect of expansion of the wood from the absorption of water. During the second week in February, 1918, a thaw and rain carried off considerable deposits of snow and a level street like that shown in the picture was very largely covered with standing and very slowly flowing water, so that the wooden blocks had full opportunity to drink their fill. The consequence is seen in the rows of blocks at intervals extending, some of them, entirely across the street, which have been thrown out upon the street surface by the bulging of the pavement, apparently from expansion lengthwise of the street.

The writer has for ten years asked for three qualities in the oil used for treating wood blocks, claiming that if the chemists will furnish such an oil the engineers can do the rest. These call for an oil that will

(1) Be heavy enough not to evaporate at the temperatures of the street,

(2) Be insoluble in water,

(3) Be liquid and penetrating enough to diffuse throughout the blocks at the temperatures usable in the processes of treatment.

The material with which the blocks used on Washington Boulevard were treated probably fails in part to meet the first condition, since the mixture probably included some very light oil, necessary to bring the specific gravity of the tar mixture within the specified specific gravity. This light oil doubtless penetrated the block much farther than the tar in the mixture, and it evaporated after the tar had bled away so as to leave the pores of the wood more open to the weather. It certainly failed to meet the third requirement, and it is probably impossible for a tar mixture to meet this requirement commercially.

A pure distillate oil of a specific gravity of 1.12 or more meets all these requirements. While it costs somewhat more than the tar mixture, the pavement really costs less because the expense of cleaning up the effects of the bleeding is practically cut off and the buckling is reduced to a minimum so that the expense of relaying broken areas is greatly decreased. These are accompanied by an increase in the life of the blocks, so that the pavement lasts longer. The slight increase in original cost, if there is any, is more than made up by either the reduction in cost of maintenance or the increase in life of the pavement.

EQUITABLE HIGHWAY CONTRACTS*

Would Benefit Both Parties Thereto—Overlooked Elements of Cost in Highway Contracting—Classification of Materials—Meeting War-Time Conditions.

The rapid growth of highway construction during the past few years has brought a large number of new contractors into the field, some of whom are not adequately prepared for handling the work. This not only has resulted in financial loss to the contractor, but also his sureties and bankers and the political subdivision for which the work is done and the general public has been compelled to share a part of such loss and also experienced inconvenience. The writer has had experience as both party of the first part and party of the second part to road contracts and can therefore appreciate both the need of cooperation between commissions and contractors and the legal restrictions that prevent the former from using their judgment and so modifying relations between the contractors and themselves as to secure conditions more equitable to the former.

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*Slightly abbreviated from a paper before the American Road Builders' Assn. by James C. Travilla, consulting engineer of the Dunn Wire-Cut-Lug Brick Co.

The specifications for highway construction have been very generally standardized. The conditions and stipulations entering into the contracts and specifications, together with their interpretation, have not. The estimates of cost of work frequently are based on incomplete or indefinite information regarding the cost of labor and material, average haul, approximate quantities, available water supply, suitable railroad facilities for receiving and unloading material, etc.

These uncertainties have resulted in introducing an element of risk to contractors bidding on highway work.

Highway commissions and contractors in estimating cost of work have not given sufficient attention to the fixed, overhead, incidental and plant expenses, labor and material market and cost data. The result has been low estimates and low bids, with unsatisfactory results to both parties, which have brought about a desire for a more equitable contract. The fixed, overhead, incidental and plant charges are very significant items in highway construction. Under this head may be properly classed the following:

Cost of bidding, contract bond, liability insurance, legal expenses, interest on deferred payments, discounting paper, traveling expenses, home and local office expenses, cost keeping, demurrage, miscellaneous freight and express charges, equipment charges, depreciation on equipment, moving equipment, tools lost, broken or stolen, loss due to weather conditions, damage to work by elements, payroll expenses during rainy and cold weather, watchmen, labor shortage, loss in damaged cement sacks, delays due to breakdowns and material shipments, cost of inspecting material, damage to private property, water charges, boarding and transporting men, entertainment, etc.

The commissions should provide proper engineering service and should not expect the contractors to furnish this or hold them responsible for mistakes due to faulty engineering. In France and England, from 3½ per cent to 6 per cent of the estimated cost of the work is provided for engineering service, and this money probably is expended more advantageously than any other sum devoted to the highway construction. Specifications, design of pavement, supervision, inspection and final results of the work depend largely upon the ability of the engineer.

Modern highway construction presents to contractors as great a number of financial risks and uncertainties as will be experienced in any branch of public work. For example, the difficulty and expense of securing labor and holding the same on the job, due to the work frequently being in isolated places; the problem of material transportation by wagon, truck, tractors or light railways; inability to prepare definite figures as to the fixed expense for car demurrage; unforeseen weather conditions, and transportation difficulties and labor conditions having a direct bearing on this item; freight rates and their subjection to change—an important factor during the past year; assuring material supply by prompt unloading and storage piles; cement storage under cover and distribution of same; the expense and uncertainty of providing an adequate water supply; the difficulties and red tape in securing necessary railroad sidings and right of way for roads to the same: providing temporary roads and bridges during the period of construction; damage to work by automobile joy riders or from other vehicle drivers who are selfish or ignorant of the damage it is possible to do to green construction by their unwillingness to be inconvenienced for a reasonable length of time (police powers of some kind should be granted to contractors to enforce observances of their road-closing signs and barricades); being responsible for damages to work by floods or other acts of God; specifying that contractors shall employ local labor and material; the loss of time by reason of delays in securing right of way, injunction proceedings, etc.; payment for work in warrants of questionable value. These possibilities in executing contracts help make the uncertainty and gamble to the contractors in preparing bids and in contracting for highway construction.

Highway commissioners have not always given sufficient attention to the proper classification of material and details of construction in preparing specifications. It is not unusual to provide for grading with no classification. This also applies to foundation excavation, where no distinction is made between "wet" and "dry" excavation. The equalization of cuts and fills and proper provisions for borrow pits, disposal of surplus material, and the determination of over-hauls are essential. Preparing the sub-grade and compensation for removal of soft or spongy material and its replacement with durable material are items of expense that should be provided for. The problem of drainage should be pre-determined and items should be provided in contracts for tiling and ditching. A reasonable unit price should be stipulated for rolling both the sub-grade and road materials.

Many coutracts fail to allow monthly estimates for material delivered on the job, which is not equitable to the dealers in materials or to the contractor. Nor do contracts provide for acceptance and final payment for part of the completed roadway; where the work is of sufficient magnitude, requiring one or more years to complete the same, this provision does an injustice to the contractor. There should be a fixed unit of two to ten miles of a completed roadway accepted and final payment allowed. A reasonable retainer of the monthly estimates is desired. Ten per cent should be considered sufficient to properly protect the commission's interests. However, it is not unusual to find the retained percentage to be 15 or more per cent.

The economic value of inspecting materials at place of loading instead of the point of delivery would frequently result in saving time and money to both parties.

The question of maintenance of roads used for hauling road material from railroad sidings and gravel pits is sometimes raised and it is not unusual to place this burden upon the contractor.

These features of highway construction are cited to show the importance of equitable contracts between highway commissions and contractors. If the highway commissions are known to be fair and equitable in the adjustment of such difficulties as they arise, it is not unusual for contractors to submit lower bids on the work proposed. Where specifications and stipulations therein are rigidly adhered to without reasonable adjustment of differences according to the spirit and intent of the contract, the bids are usually higher.

In suggesting features coming directly under the direction of highway commissions in preparing specifications, contracts, and in the execution of work, there is also an obligation on the part of contractors and the material interests identified with them to be fair and reasonable in their dealings with the highway commissions. Contractors should take pride in their work, be financially responsible to carry it through, provide modern equipment and an organization of competent men and, further, have established a reputation for doing good work. It should not be difficult to agree upon more equitable contracts when these features as set forth are fully appreciated by both parties.

At road lettings, it has been the general practice to call for unit bids based upon approximate quantities. Under normal conditions this method is more satisfactory in road work than to bid a lump sum for the completed improvement. The unfortunate feature of public lettings is the awarding of contracts to the lowest bidders regardless of their responsibility or experience. The highway commissions not infrequently figure it will be necessary to depend upon the sureties or "some angel" to complete the work.

This condition may be somewhat remedied by requiring certain qualifications of a bidder as to financial ability, experience, equipment, etc., before giving him a bidding blank. The size of job should be sufficient to attract responsible bidders and warrant the expenditure of proper sums for modern equipment and appliances.

The officials of railroad and electric railway companies, when about to build railroads, generally invite a limited number of responsible contractors to submit proposals for the work at cost plus a fixed sum or on a unit basis. Such contracts usually are executed without "grief" to either party.

Owing to legal restrictions placed upon highway commissions under our present form of government, this procedure does not seem possible, especially when we realize that politics have not been entirely eliminated from road construction, the limited tenure of office of public officials, and the general lack of confidence on the part of the public in its servants, regardless of their honesty, ability or unselfish efforts to faithfully carry out the trust imposed in them.

The precedent established by The American Institute of Architects in adopting standard documents, including contracts, specifications, etc., and by making the general conditions and stipulations more equitable to the contracting parties and by introducing the very important principle of arbitration, if followed by highway commissions would result in the creation of more equitable contracts between the contracting parties. The State Highway Engineers Association is working on the standardization of highway specifications and forms of contracts. The enactment of laws where necessary, authorizing arbitration of all questions in dispute between highway commissions and contractors, is considered an essential before standard and equitable relations can be established between the contracting parties.

WAR-TIME CONTRACTS.

The suggestions herein offered for more equitable contracts between contracting parties for highway construction are not all that are desired under the present abnormal conditions of the labor and material market which necessitate contractors assuming an unjustifiable amount of risk in signing contracts.

The recognized necessity of continuing to build selected highways that will best serve the country in time of war as well as peace, and to further provide for the employment of a class of labor not adapted for work in munition plants and other industries necessary to help win the war, make it of sufficient economic importance for the prosperity of all classes of labor to proceed with the improvement of selected highways in a manner equitable to both parties to the contract. Several methods of letting work to accomplish this end are suggested:

(1) The contractors to submit proposals on a form, provided by the highway commission, that sets forth the rates of labor, estimated cost of manufacturing materials and quotations on the materials required; the bids to be tabulated, analyzed, and the award to be made on the best bid, considering all the items; the labor and material items to be not less than the prevailing rates and quotations recognized at the time of bidding. This information should be set forth in the instructions to bidders. The contractor shall at any future time, if required, be prepared to show by what procedure said prices were arrived at. Thereafter, the commissioners, on due proof of pay rolls, bills and receipts that the rates and quotations used in preparing the bid have been substantially increased, shall grant a hearing to the contractor and be authorized to allow such additions to the unit prices stated at time of letting as will insure the contractor against actual loss due to the changed rates and prices, but this shall in no case cover the losses due to inefficient handling of the work or from faulty estimating of said cost. It is preferable that at the time of change in the wage scale or advance in price of material, the contractor be requested to at once ask for a hearing before the commission to determine whether the request shall be allowed. If the commission decides that it is better to delay the work, it shall make an equitable adjustment with the contractor to cover the fixed charges such as plant rental, overhead and incidental expenses for the delay caused in completion of contract. It should be further provided that in the event of extraordinary conditions such as embargoes on cars or material beyond the control of the contractor which caused delay in the completion of the work, an allowance shall be made in the specified time limit for doing the work; and if a loss is incurred from such delay, he should be reimbursed for the expense of plant rental and necessary overhead and incidental charges.

(2) Another equitable method of constructing highways is to have the highway commission purchase and deliver road material F. O. B. nearest railroad siding, the contractor's proposal to provide for furnishing labor, equipment and appliances, the labor to be paid the prevailing rates and the equipment at a fixed rental per diem for the actual time used, all of which is to be definitely set forth on the bidding blank, including the percentage of the cost of labor to be allowed the contractor for his profit and overhead expense.

(3) A method sometimes adopted in awarding contracts is to allow the contractor the actual reasonable cost of labor and material entering permanently into the work, as determined by the highway commission, plus a fixed per cent of such work. In figuring the labor cost of highway construction, the following items shall be included:

(1) Actual pay roll expenditures for labor.
(2) Foremen and time keeping on the work.
(3) Liability insurance paid on same.

The cost of materials entering into the work will be determined by the material, freight and hauling bills for the same. The fixed per cent allowed to cover the profit, overhead, equipment and incidental expense.

In conclusion, it may be stated the personnel of the commission and the laws on the statute books are important factors in arriving at equitable contracts between the contracting parties. Given commissioners who have had liberal business or technical training, working under reasonable legal restrictions and dealing with contractors of the same type, both parties appreciating the financial risk and uncertainty in entering into contracts under the present abnormal conditions, the contingent expenses heretofore referred to, and the suggested methods of eliminating such risks, then both parties should be in a position to cooperate in drafting an equitable contract between highway commissions and contractors.

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THE 1918 ROAD PROGRAM.

How much road work will actually be done during the present year it would be impossible for anyone to forecast, since so many conditions may arise to affect it, these involving the raising of the funds, securing of materials and transportation of same, and obtaining the necessary labor. So far as intentions are concerned, however, the road construction program as outlined for the year exceeds in money value that of any previous year and is nearly double that spent in 1917. This statement is based upon information compiled by a large and reputable manufacturing concern, which states that the figures were obtained from the highway officials of the various states. These sums include, we understand, the amounts to be spent by state authorities, together with those to be contributed from the federal aid fund, and also the amounts to be spent by counties. The sums attributed to the individual states vary from $560,000 in the case of Nevada to $25,000,000 for the state of Texas. The total for all the states is more than $263,000,000.

In no case, we believe, has any state a desire to interfere with the use of money, materials, or labor that are essential to the war; and we presume that in the majority of cases a very important consideration in the formulating of the road program was the necessity of supplying highways for the transportation of food and war materials or for relieving railway transportation by motor truck traffic. In the case of Texas, for instance, whose ambitious program exceeds by 50 per cent that of its closest competitor, it has been widely advertised that the aim of the state highway department is to provide "military roads," furnishing connected routes both east and west and north and south across the enormous expanse of that state.

Probably the first obstacle that may present itself in the forwarding of this program will be the financial one. It remains to be seen what will be the attitude of the federal administration toward the issuing of bonds for this large amount, and whether a market can be found for them at a reasonable rate of interest. The effect which such bonds would have upon the floating of the government Liberty Bonds is, of course, an important point. Large as the sum is, however, it is to be borne in mind that it is to be raised and spent over the entire area of the United States, and the total amount involved does not exceed probably 5 per cent of the amount of Liberty Bonds that will be issued this year.

In the matter of obtaining material, much can be done by the states themselves towards solving or anticipating any difficulties along this line. If every effort is made to locate and utilize local materials or those within truck-hauling distance, this difficulty can be largely avoided in most cases. In some states and for some highways, the complete attainment of this will perhaps be impracticable. For instance, a considerable amount of bituminous binder will perhaps be considered essential on a large percentage of the roads, and this material is "local" over only a limited section of the country. If either brick or concrete wearing-surface is substituted for a bituminous one, here again we find only a limited percentage of the entire country which can obtain these materials within truck-hauling distance. In spite of this, however, much can be done in every state to reduce to a minimum the amount of hauling required by its road program, both in choosing materials and in seeking local supplies of them.

In the matter of labor, we have already suggested that a much more extensive use could be made of those who are maintained in idleness at the expense of the state, these being to a large extent the prisoners in jails and reformatories with possibly some use of those on poor farms and in other institutions. An additional source of labor is suggested by a law that is just being put into force in the state of New Jersey, requiring every male whose age and physical condition does not debar him from labor to engage in some useful employment, and if he does not find such employment himself, the state will itself put him to work, as a free man if he will, but if not as a prisoner. If this law should be adopted generally throughout the country, we believe that any state could round up, in its large cities, enough idlers to go a long way toward carrying out its road construction program.

ENGINEERS WITH DITCHING AND DRAINING EXPERIENCE WANTED.

The U. S. Public Health Service is in pressing and immediate need of engineers who have had experience in ditching and draining operations, to assist it in taking measures for the prevention of malaria in districts adjacent to southern cantonments. This offers an opportunity to a number of engineers to aid materially in winning the war, especially to those who may have been refused military service because of slight physical defects.

The adequate control of malaria is essential to the maintenance of the health of troops in the south as well as those residing in districts adjacent to military cantonments. Helping to control the malaria situation is therefore an important piece of war work, and it is hoped that all engineers who have had any experience which would assist them in performing such service will communicate at once with the "Surgeon-General of the U. S. Public Health Service, Washington, D. C."

The WEEK'S NEWS

Improvements on Lincoln Highway—Repaving New York's Streets—Work of Oklahoma's State Health Board—Disease Among U. S. Military Forces—Philadelphia Suburbs Win Lower Water Rates—New Jersey Gas and Electric Utilities Get Emergency Rate Increase—National Daylight Saving to Be Inaugurated—Fire Equipment Standardization in Connecticut—Commission Form Elections in Three Towns—San Francisco Research Bureau Wins Right to Examine City Records—Portland, Ore., to Fight Six-Cent Fare.

ROADS AND PAVEMENTS

Type of Pavement on Lincoln Highway.

Detroit Mich.—According to the Lincoln Highway Association, work done upon the Lincoln Highway from coast to coast includes the following types and the mileage of each:

	Miles.
Concrete	227
Brick	104
Bituminous macadam, resurfaced	395
Macadam, new construction	37
Macadam, resurfaced	275
Gravel	415
Natural dirt road graded	750
Total	2,250

The remaining one thousand miles of Lincoln Highway is, of course, not entirely unimproved. Much of the road was in an improved condition before it was designated as a part of the Lincoln Highway and remains so today. An important feature connected with the improvement is the reduction in mileage being made upon the road between the two terminal points at New York and San Francisco. As originally outlined, it was the purpose of the Lincoln Highway Association to establish the route from coast to coast in the most practical and efficient manner and as near in a direct line as was consistent with the topography of the country. As originally laid out the Lincoln Highway was 3,389 miles in length. According to the figures just compiled by H C. Ostermann, field secretary of the association, this mileage has now been reduced to 3,325 miles, the decrease being accounted for by the elimination of sharp turns and the building of many new bridges, permitting a marked straightening of the road. The high efficiency of the Lincoln Highway as through, connected route of travel from the Atlantic to the Pacific is indicated by a comparison with other existing mileages. The air line between New York and San Francisco is 2,700 miles. The best railroad connection is 3,181 miles, and 3,370 miles of telephone wire are needed to connect the two points.

Court Says Pavement on Old Base Is Repavement.

Newark, N. J.—Street repaving is none the less repaving, even though a pre-existing concrete base is utilized. This is the basis of a decision by Judge Adams in the Circuit Court, confirming assessments which were objected to by Roseville avenue property owners. The point at issue was the protestors' contention that the pavement constituted merely repairs, and that the cost should be levied on the city at large. The city's claim was that the work was repavement and justified assessment on the property owners. "If the concrete base had been torn up and another base substituted for it," runs the decision, "so all the material would have been new, that would have been repaving, but repaving of an extravagant kind, and the arm of the law might have been extended to arrest such a waste of money." Rosedale avenue was bricked in 1896. The brick was set in sand on a concrete base. Repairs made from 1905 to 1915 cost the city $2,072.12. A change was needed, but property owners were divided, some favoring a sheet of asphalt on the brick and others a substitution of asphalt block or wood block. It was recommended that the concrete foundation and the curbstone be retained so far as available, and that additional catch basins be put in. The board of works heard representatives of the land owners and finally adopted the plan of laying wood blocks. Of the cost, totaling $44,886.20, about thirty-one per cent, or $13,336.60, was apportioned to the city, and $31,549.60 to the land owners. Judge Adams, in his decision, said the court has nothing to do with the comparative merits of the different plans of improving the street. He ponted out that the choice rested in the official judgment of the board of works, and called attention to the fact that the ordinance treated it as a repaving. Answering his own question of "Was it repaving?" Judge Adams continued: "It substituted another pavement for brick for the entire width of the street. It was a plain dictate of economy that the pre-existing concrete base should be used as far as possible, and this was done. About six and one-half per cent of new curb was put in. All the rest of the old curb was either reset in concrete or dressed as it was in place. About three-fourths of the concrete base was intact and was used."

New York's Repaving Program.

New York, N. Y.—The board of estimate has made appropriations aggregating $3,500,000 for the repaving of streets in the various boroughs in the current year. Of the total amount $2,000,000 was allotted to Manhattan, $600,000 to Brooklyn, $400,000 to the Bronx, $300,000 to Queens, and $200,000 to Richmond. Manhattan's appropriation for repaving work, which is much larger than it has been in recent years, was urged by borough president Frank Dowling because of the condition of the pavements throughout the borough. With the money appropriated president Dowling said that portions of seventy-five of the principal thoroughfares of the borough would be repaved. Twenty-seven of the streets and avenues leading to ferries and steamship piers will be repaved with granite blocks of the most modern type and forty-eight will be restored with sheet asphalt. In nearly every case the pavement will be laid on concrete foundation. It is stated that no wood block or asphalt block will be used in the work to be undertaken this year. Seven of the thoroughfares under which new subway tunnels have been constructed are included in president Dowling's repaving program. It is expected that most of the work will be under way before May 1.

SEWERAGE AND SANITATION

Ask Coal Supply for Passaic Sewer Work.

Newark, N. J.—Pleading the need from a sanitary viewpoint of the expeditious completion of the Passaic Valley sewerage system, a letter asking assistance in procuring a regular supply of coal for the construction contractors has been sent to Fuel Administrator Garfield by the Passaic Valley sewerage commissioners. The communication asserts the system will relieve the pollution of the Passaic River. After expressing appreciation of the assistance given on previous occasions when lack of coal indicated the task would have to be suspended temporarily, the letter says:

"The Passaic Valley sewerage project, which the commissioners are constructing under appointment by the Governor of New Jersey, consists of extensive metropolitan sewerage works designed to intercept from twenty municipalities the sewage flow which is now being discharged into the Passaic River and Newark Bay.

"These twenty municipalities have a present population of about one million and the total sewage discharged by them into the Passaic River approximates 120,000,000 gallons daily. As a consequence of this discharge of sewage, the Passaic River is highly polluted, in fact, it is one of the foulest streams in the United States. The waters of the river are heavy and black, are devoid of oxygen and without fish or animal life.

"The odor under summer heat is almost unbearable. It is needless to point out the insanitary and depressing effect of such a tidal stream, the waters of which flow back and forth twice each day. The communities affected, as well as the state of New Jersey, are keenly anxious to be rid of this menace to health and to free themselves from the train of insanitary conditions which emanate from the polluted waters.

"Upon the completion of sewerage works, the sewage and trade wastes will be diverted from the river to treatment works. After clarification the sewage effluent will be discharged through deep sea outlets and disposed of in a modern and sanitary manner. Construction work was begun on the project in 1912. Since that date the work completed, or under contract and approaching completion, totals $12,500,000.

"The estimated cost for completion is $3,000,000, and the time required is about eighteen months. None of the work which has been done can be used and no advantage of the large sum of money already spent can be had until the completion of the remaining portions of the outfall works.

"The abatement of the nuisance set up by the Passaic River and marked improvement of the sanitary conditions of this populous district will be an item of no small importance to many large industrial plants which are actively employed on war work, to the shipping on the river, to the extensive quartermaster's stores which are being built adjacent to the polluted shores, and to the immense ship yards which are in operation for the Shipping Board.

"With these facts before you, the importance of the early completion of the Passaic Valley sewerage works to the metropolitan district of New Jersey becomes clear from the financial and sanitary and industrial points of view. Unless coal can be regularly obtained, the progress upon the works cannot be maintained.

"The commissioners are appreciative of the assistance which the fuel administration has rendered and they request that future consideration be given as to future coal supply needed."

Book Explains Work of Health Board.

Oklahoma City, Okla.—A very thorough and practical health book has been prepared by the state board of health and is now being distributed. The book contains not only the rules and regulations of the state board, but much other practical matter relating to the conservation of public health. It is the work of Dr. John W. Duke, state health commissioner, and Dr. Herbert V. L. Sapper, assistant commissioner. It is intended for distribution to all public health officers in the state, to physicians, to other officials who may desire it, to school principals, heads of women's clubs and other similar organizations, and in general to all to whom it may be of service in bettering public health conditions. This book consists of about 250 pages and is in a form convenient for distribution and reference. The scope and powers of the state health board are fully explained. The book is divided into nine parts and an index as follows: Fundamental laws governing the state health board; sanitation and quarantine code; protection of water supplies and sewage disposal; public nuisances and health regulations; food and drug standards; rules governing food making establishments and rules and regulations covering sanitary conditions in hotels and rooming houses; rules for the disposal of bodies; vital statistics regulations; miscellaneous sanitary regulations, especially those aiming at cooperation with Federal health authorities; rules regulating state laboratories and distribution of antitoxin; general index. The book is provided with convenient cross references.

Rigid Inspection and Scoring of Drug Stores.

Cleveland, O.—A "score card" system has been inaugurated by the city chemist, Wilbur White, to check unsanitary conditions in Cleveland drug stores. Cleveland, according to Mr. White, will be the first city in the country in which this plan will be adopted in connection with pharmacies. A city wide sanitary inspection of drug stores has been begun by officials attached to the chemist's office. On the basis of the conditions found in each, cards will be issued by which the public may know whether the drug store in which they are dealing is clean or otherwise. "Most of the drug stores in Cleveland are in very good shape," the city chemist stated, "but there are some in which conditions are far from desirable. Our investigation is intended to make an end of such things as dirty prescription cases, balances or other utensils. When it is completed, the score cards will be issued and the results published. A white card will be given to drug stores which score 90 or over, which stands for the highest standard. Blue cards will score between 80 and 90, representing fair conditions of the store, and red cards will designate scores below 80, which will be considered unsatisfactory." Mr. White stated a similar scoring system has been in effect two years with reference to groceries and dairies. The investigation, the official indicated, would also be directed at druggists who are handling "fake drugs," of which he declared about 400 packages had been seized recently. He said all pharmacists had been warned against these goods and that in case any more are discovered there are to be prosecutions. Practically all substances put under ban by city chemist White, he explained, are imitations of German, Swiss and American drugs, the cost of which, if genuine, would be as high as $60 a pound.

Disease Rates in Army.

Washington, D. C.—This table, from reports to the Surgeon General of the Army for the week ending March 1, gives the annual rate per 1,000 for special diseases among the troops in this country and the Expeditionary Forces:

	All troops in United States.	Regulars in United States.	National Guard, all camps.	National Army, all camps.	Expeditionary Forces (week ending Feb. 21, 1918).
Pneumonia	19.7	22	20.6	16.8	21.3
Dysentery	0.2	0.2	0.1	0.3	0.4
Malaria	0.5	0.8	1.3	0.0	0.4
Venereal	97.1	121.5	53.4	100.6	55.3
Paratyphoid	0.0	0.0	0.0	0.0	0.0
Typhoid	0.2	0.6	0.0	0.1	0.0
Measles	34.7	54.7	10.2	31.1	26.9
Meningitis	1.5	1.7	1.9	1.3	6
Scarlet fever	12	14.6	2.9	14.5	10.5

WATER SUPPLY

Lower Rates for Philadelphia Suburbs.

Philadelphia, Pa.—Residents of the suburbs of Philadelphia scored a victory against the Springfield Consolidated Water Company, when the public service commission issued an order at Harrisburg directing the company to establish a new schedule of rates, effective April 1. As a result of this decision at least a third of the customers of the water company will enjoy a reduction of about one-third in their water rate annually. The announcement was heralded as a victory by the suburbanites, who have been fighting the rates of the company since 1910. The commission has fixed $6,953,320 as a fair value of the company. According to the order, the concern, which supplies water to scores of suburban towns, is allowed a return of 7 per cent upon that valuation. The commission's order disposes finally of the complaints of the residents of Conshohocken and the boroughs of Clifton Heights, Tinicum, Darby, Glenolden and Eddystone. The commission for several years has been investigating the complaints and making an inventory of the company's assets and a survey of the watersheds from which the supply comes. The case was the most important involving a water company that has come before the commission. The testimony was closed in October, 1917. The report prepared by the accountants and engineers for the state filled forty volumes. It is said that the state expended a sum in excess of $20,000 in the preparation of the case.

The order fixes uniform rates for the entire district, which is one of the largest supplied by a private water company in the state. The new schedule of rates fixed by the commission provides for a minimum payment dependent upon the size of the meter to each consumer. This minimum for a five-eighths-inch meter is $12 per annum and increases gradually to $300 for four-inch meter. In every case the minimum payment covers the furnishing of 30,000 gallons of water a year. At present the rate for the five-eighths-inch meter is $18 a year and provides for 45,000 gallons yearly. It is estimated by W. H. Roth, secretary of the company, that at least 33 per cent of its customers do not use in excess of 30,000 gallons of water a year. But despite the fact that they did not utilize their quota of water, they had to pay the full rate. Under the new rate this particular class of customers will enjoy a reduction in rate of 33 1-3 per cent. Of the 1,200 service customers in Conshohocken more than 900 use the five-eighths-inch meter and will have their rate reduced $6 a year. The commission decided that extensive improvements and enlargements of the system are required and the construction of this work must start at once, the work being divided into yearly programs covering a period of three years. The estimated cost of improvements to be installed this year is $1,048,100. This sum was added to the fair value to obtain the amount upon which the return to the company should be figured. The company is therefore allowed a net return of $560,099. The commission estimated the annual operating expenses should be $262,500, with an allowance for depreciation of $59,633, making a gross annual revenue of $882,232. The company is directed to make all street extensions which are reasonably required, thus removing one of the greatest sources of complaint. Prior to this time consumers have been required to pay for street extensions, involving over fifty feet of 6-inch pipe. Rates are fixed for fire service dependent upon the number of miles of pipe over four inches in diameter in each municipality, and it is calculated that the charges for fire service will return a revenue of $180,130, while those for domestic service will bring in $702,102. The fight against the water company was waged in the Common Pleas Court of Montgomery County in 1910. At the end of two years the court ruled that the burden of proof rested on the complainants. The case was subsequently brought before the public service commission, shortly after that body was appointed. The commission reversed the finding of the Montgomery County court and placed the burden of proof on the water company. The new rates are:

A. MINIMUM CHARGE SCHEDULE.

All services except public and private fire services shall be subject to a minimum charge, which shall include the furnishing of 30,000 gallons of water annually. This minimum charge shall be based upon the size of meter and shall be as follows, payable quarterly:

	Per Annum
For a meter ⅝ inch or less	$12
For a meter ¾ inch or less	16
For a meter 1 inch or less	25
For a meter 1½ inch or less	50
For a meter 1¾ inch or less	65
For a meter 2 inch or less	85
For a meter 2½ inch or less	125
For a meter 3 inch or less	175
For a meter 4 inch or less	300

B. METER SCHEDULE.

All output services of whatever kind rendered by the respondent to its patrons shall be on the meter basis, as follows:

In excess of 30,000 gallons and up to 500,000 gallons, twenty-one cents per 1000 gallons.

In excess of 500,000 gallons and up to 2,000,000 gallons, eighteen cents per 1000 gallons.

In excess of 2,000,000 gallons, twelve and one-half cents per 1000 gallons.

C. PUBLIC FIRE PROTECTION SCHEDULE.

For all public fire services the following yearly charges will be made:

For each public fire hydrant in each political subdivision, $7 per annum.

For each mile of pipe four inches or greater in diameter in each political subdivision where such pipe furnishes actual or potential public fire service, $355 per annum.

D. PRIVATE FIRE PROTECTION SCHEDULE.

For all private fire protection services the following yearly charge will be made:

Where hydrants are owned by the water company, $15 per annum.

E. Where service is now being rendered at a flat rate meters shall be installed by the company at its expense as rapidly as possible and the installations completed prior to January 1, 1919; in the meantime such service to be charged for at a flat rate to be fixed by the company with the approval of the commission, such rate to be computed so as to result in reductions comparable to those provided for in the meter rate schedule. These services are to be paid for in advance quarterly.

Angry Consumers Destroy Meters.

Upland, Cal.—Because residents of the Cucamonga district had received water for domestic use for ten years or more at a flat monthly rate, they took violent exception to the installation by the California Vineyards Improvement company of water meters. By way of showing their displeasure, a score or more attacked the measuring devices with sledge hammers, chisels and other instruments, in many cases tearing the meters out bodily. The company, under contract to supply domestic water, threatened to cut off the supply entirely. The consumers have decided to take the matter before the state railway commission. At a hearing before examiner Westover a number of consumers sought to force the Vineyards company to supply an adequate amount of water to all consumers the year around, claiming that those at the upper end of the system are frequently without it. The company in turn asked the commission to fix a rate sufficiently high to prevent consumers on the lower end of the lines from using as much as 50,000 gallons for irrigation instead of their allotted 4,000 gallons, thus draining the system. The Vineyards company contends that it has only a limited supply of water and that unless action is taken to prevent its promiscuous use by part of the consumers, others will suffer.

Water Superintendent Reinstated.

Youngstown, O.—John S. Lewis, deposed superintendent of city water works, has been reinstated in his position by the court of appeals, which ordered a writ of mandamus issued against mayor A. W. Craver and service director William L. Sause. Proceedings in the civil service commission to which had been appealed the removal order against Sause, were reviewed and the contentions of Lewis that charges of inefficiency and incompetency were not sufficiently explanatory for him to answer them were upheld.

STREET LIGHTING AND POWER

Extensions by Ontario Power Commission.

Toronto, Ont.—The provincial government has appropriated $9,054,951 for expenditure on capital account by the Ontario Hydro-Electric Power Commission. The main extensions and improvements are as follows: Chippawa Creek development, $4,175,000; Niagara system extensions, $2,865,000; Central Ontario system extensions, $528,000; Severn system, $405,000; Eugenia Falls system, $233,000; Port Arthur system, $150,000; St. Lawrence system, $251,000; Rideau system, $117,000; Nipissing system, $60,000.

Big War-Time Rate Increase for Jersey Utilities.

Trenton, N. J.—Declaring that it is of prime importance that the property of public utilities be maintained in condition to render effective service, the public utility commission recently handed down two decisions under which the Public Service Gas and Public Service Electric companies will be permitted to increase their rates so as to yield a revenue of approximately $1,000,000 a year to each company more than would be received under existing rates. The board emphasizes the fact that the increases are approved solely as war-emergency measures and do not affect the reasonableness of the proposed rates in normal times. The board also reserved the right to abrogate or modify the new rates should conditions indicated by operating results warrant such action. The increased rates, which were made applicable in February, are not in accordance with the original suggestions of the gas and electric companies, but are based upon the board's findings as to the equitable method of providing additional revenue. In the case of the Public Service Electric company, instead of permitting the horizontal rise of about 35 per cent on current furnished for power purposes the board decided that the company may add to each bill of power customers a war addition of 25 per cent. In addition it allowed a surcharge for coal, though on a different basis from that now in force. To provide additional revenues for the Public Service Gas company the board authorized a war surcharge of seven cents per 1000 cubic feet of gas consumed to be added to all bills. It required the company to withdraw all rates under the present schedule which are less than sixty-five cents per 1000 cubic feet. This provision affects only the large consumers. The estimate of the company for operation in 1918, after paying rentals, 8 per cent on outstanding capital stock and $1,500,000 to be used for construction and working capital and providing general amortization, showed a prospective deficit of $1,338,000. The board pointed out that in this estimate the appropriation for general amortization was a little more than double the amount it would be under the rule applied by the company in the four years prior to 1917, while the appropriation for 1917 amounted to only a quarter of such appropriation. In disposing of the request of the Public Service Electric company for an increase of revenues approximately $1,800,000 a year the board said it was evident it should not approve an increase of more than $1,400,000 over what would be obtained from the present rate. Considering all factors, the board expressed the opinion that an increase of $1,000,000 would enable the company in 1918 to pay its rentals, to pay dividends of 8 per cent on its capital stock and to appropriate to general amortization a sufficient sum under present conditions, even should these continue throughout the year to be as unfavorable as the estimates of the company indicate. "The board does this entirely as a war emergency measure," says the decision with regard to the gas surcharge, "and does not at this time pass upon the reasonableness of the rentals and dividends paid by the company; nor upon the reasonableness of the company's appropriations for general amortization. Such and like matters must be left for consideration under normal conditions."

Right to Refuse Electric Service.

New York, N. Y.—In a decision on the question of discontinuing of electric service in a complaint against Richmond Light & Railroad company, the public service commission of the first district holds that refusal of service by an electrical corporation except upon payment of a penalty because the service connection has been tampered with is unauthorized under the law. Because, however, complainant may obtain redress by the penalty action under the transportation corporations law and because of the uncertainty as to the commission's power herein, no order was adopted. It was recommended that upon payment by the complainant of $1.80 for each of the three months during which the meter failed to register service be renewed by the electric company.

Daylight Saving Bill a Law.

Washington, D. C.—The daylight saving bill has been signed by President Wilson. It puts all clocks forward an hour on the last Sunday in March and turns them back again the last Sunday in October. The daylight saving plan will be in effect during that period and be observed without the slightest disorganization or impairment of existing conditions. Trains will run as usual, and every feature of daily life into which the element of time enters will remain unchanged. The plan's practicability and efficiency have been demonstrated in twelve European countries. Advocates of the plan in presenting their case to Congress explained that the following beneficial results would be achieved by the system: A great saving of illuminants, such as oil, gas, and electric power. Marked conservation of coal. Increased manufacturing production as the result of improvement in working conditions. General benefits to the national health because of an additional hour of daylight, which may be devoted to recreation. Reduction in the cost of living to some who can raise garden truck for domestic consumption.

Fifty-two reasons for passing the bill were given to Congress by the committee on daylight saving of the United States chamber of commerce. The savings would occur in both direct and indirect ways, says the report. The amount of coal that will be saved if the clock is moved ahead one hour would differ with the method in which daylight saving is used. Calculations computed for different periods, based upon the actual British experience in the summer of 1916, and modified by allowances for differences in latitude, give the following savings in coal for the United States:

1. With saving of 150 hours (by daylight saving between second Sunday in April and last Sunday in September): Amount of coal used for lighting through gas and electricity, approximately 15,750,000 tons; amount saved, 804,000 tons; percentage saved, 5 per cent.
2. With saving 190 hours (with clocks moved ahead one hour between April 1 and November 30): Amount of coal used for lighting through gas and electricity, approximately 15,750,000 tons; amount saved, 1,019,000 tons; percentage saved, 6.5 per cent.
3. With saving of 198 hours (with clocks advanced one hour throughout the year): Amount of coal used for lighting through gas and electricity, approximately 15,750,000 tons; amount saved, 1,061,000 tons; percentage saved, 6.6 per cent.

"These figures do not include the saving which would be obtained at isolated plants and at electric power plants which sell power for lighting. To be borne in mind, too," says the report, "is the fact that the estimate has been made on a basis which assumes the use of electric energy and gas for lighting is spread evenly over the country, whereas, as a matter of fact, 57,000,000 electric lights out of a total of 76,000,000 in the country are in New England, Middle Atlantic and North Central states where the advantages of daylight saving will be most striking. For example, take the Commonwealth Edison Co. of Chicago, whose peak load is needed for no more than one and one-half hours a day."

Increased Efficiency of English Plant.

Bristol, England.—The municipal authorities of this city have decided to extend the electrical plant by providing a 6,000-kilowatt turbo-alternator, four water-tube boilers, and a switch gear. These extensions are necessary on account of the increased demand for electricity. In regard to the scarcity of coal, it has been pointed out that, while 18.75 pounds of coal were consumed in 1895 to produce a unit of electricity, in 1917 the quantity to produce a unit was reduced to 4.938 pounds. The coal consumption per unit has been cut to approximately a quarter what it was 20 years ago. While in 1917 only 56,000 tons of coal were consumed, at the former rate of consumption 200,000 tons would have been used.

FIRE AND POLICE

Urge Standardization of Fire Equipment.

Hartford, Conn.—Towns and cities in Connecticut which have fire departments are to be called upon by the Connecticut state council of defense to put into effect throughout the entire state a plan for the interchange of fire apparatus in emergencies. The matter has been investigated by the council's committee on industrial survey, which has reported that, due to the efforts in the past few years of the Fire Chiefs' association, there is mutual aid co-operation to a very considerable extent among the various towns and cities. The committee recognized the desirability of a standard thread on hose and hydrant couplings throughout the state, but did not recommend at this time any effort to change the various threads now used. Instead, it recommended most strongly that every fire department in the state be equipped with a sufficient number of standard adapter couplings to permit of ready mutual aid. The adapter coupling proposed has been designed under the direction of John C. Moran, chief of the Hartford fire department, who was named by the Fire Chiefs' association a committee of one to assist the council's committee in this matter. The committee also has had the benefit of the advice of Horace B. Clark, chairman of the board of fire commissioners of Hartford. The state council of defense has arranged to secure these couplings at $5.75 each on orders in excess of 350 pieces, and towns are to be given an opportunity to buy them from the council at this rate. The committee makes the following recommendations: "That it be authorized in the name of the council to instruct the various local agencies of the council as follows: (1.) In cases where authority is not at present vested in the chief or acting chief to ask or render assistance in emergency, to obtain for him such authority. (2.) To arrange with the local departments in their districts, to place orders directly on the state council of defense for a suitable number of hydrant and hose couplings."

Big Courthouse Destroyed.

Springfield, O.—Clark county's fine courthouse, which it is believed will cost $500,000 to replace, is in ruins as a result of an early morning fire which gutted the building. A high wind was raging at the time, sweeping the flames in all directions and the entire department was summoned to combat it. The fire continued to rage despite the efforts of the department and the fact that ten lines of hose were playing on it for three hours. Aided by the strong gale, the flames spread rapidly at first, sweeping from one end of the attic to the other and then down to the second floor. The clock in the tower was completely destroyed and tumbled over. The flames did not reach the records which were kept in the clerk's office on the lower floor. Most of them were stored in the vault and were not damaged. The sheriff's office on the lower floor was not damaged. The law library was also badly damaged. Prisoners in the county jail adjoining the court house became excited, and were removed to the city jail.

GOVERNMENT AND FINANCE

City Votes to Retain Commission.

Sioux City, Ia.—Sentiment of Sioux City voters at the special election was overwhelmingly expressed in favor of retaining the commission plan of government instead of returning to the aldermanic form. Exceeding even the predictions of the leaders among the defenders of the commission plan, the proposition to return to the aldermanic form was defeated by 1,780 majority. Out of the 5,710 votes cast the proposition to change the form of government received only 1,965, while the ballots against it totaled 3,745. A single precinct out of the fifteen in the city gave the aldermanic system a majority of 83 votes.

City Manager Plan Adopted.

Sioux Falls, S. D.—Sioux Falls adopted the city manager plan of municipal government, to supersede the present commission system, at a special election. The majority for the city manager advocates exceeded 700. A light vote was polled.

A motion was filed in the circuit court for an injunction to restrain the mayor and city from calling an election to choose nine new commissioners, as required under the city manager plan, on the grounds that the South Dakota statute, enacted by the 1917 legislature, granting authority to cities to adopt the manager plan is unconstitutional.

Illegal to Pay Salaries of Employes in Army.

Niles, O.—The state bureau of public accounting has decided that it is unlawful for municipalities to pay salaries of employes in military service. The finding was in a case where the council of Niles paid to Bert Halloway, superintendent of the light and power plant, half of his salary after he had enlisted in the army. This action of the council, the bureau held, is commendable but illegal.

Research Bureau Wins Right to See City Records.

San Francisco, Cal.—According to a decision by Superior Judge George E. Crothers, city officials must show records of the Hetch-Hetchy project to representatives of the Bureau of Governmental Research. The city engineer had refused to give the bureau, organized by taxpayers, access to public documents and records concerning the Hetch-Hetchy. Colbert Coldwell, representing the bureau, had brought suit against the city engineer and the board of works, for this refusal, and the city attorney in his answer had sought to evade the issue. When the plaintiff demurred to the answer, the issue came before Judge Crothers for action. Assistant city attorney Robert M. Searls said he would take an appeal direct to the supreme court. Otherwise the result of Judge Crothers' decision would be to bring the case to trial before him. In the answer, which is now thrown out of court, the city engineer had attempted to contend that papers in his office did not become public documents until the board of works has taken some action in a public meeting based upon them. Judge Crothers sweeps this pretense by quoting the Political Code, which expressly states: "The public records and all other matters in the office of any officer are at all times during office hours open to the inspection of any citizen of the state." Judge Crothers also calls attention to the Code of Civil Procedure, which provides that: "Every citizen has a right to inspect and take a copy of any public writing in this state, except as otherwise expressly provided by statute." It is not contended, says Judge Crothers, that the records in question, if held to be public records, come within the statutory exception. In regard to the public officer having records in his charge being allowed to use his discretion as to whether the public may have access to them, he holds with the Appellate Court, which recently decided an almost identical question (Mushet vs. the Public Service of the City of Los Angeles), that a county may be said to be an involuntary public corporation and the public residing therein virtually the corporators, and that the public records are the property of the county and not the property of the officer in whose custody they have been placed. It was held in that case that the officer is the mere custodian of the records, and his duty is to keep them safe for the use and benefit of the officers and public to whom they belong, and that under the common law and aside from any express statute, all such records are open to the inspection of any citizen.

But in the suit of the bureau against the board and the engineer, the judge calls attention to the fact that the charter of San Francisco expressly provides just what papers and records must be kept officially and what are open to public inspection, and leaves nothing to the discretion of any official, except as to police records. The charter provides that: "The board shall keep and preserve a record of all its proceedings, and copies of all plans, specifications, etc., and all papers pertaining to the transactions of the board," and also that "all books and records of every office and department shall be open to the inspection of any citizen at any time during business hours." According to a statement by Bruce Cornwall, chairman of the board of trustees of the research bureau, "the San Francisco Bureau of Governmental Research has maintained that records in public offices belong to the public, and that citizens are entitled to know the full facts at all times in regard to what is being done on any public project. The bureau, as an organization whose only weapon is facts, has always maintained that the questions involved in this case were bigger than Hetch-Hetchy—bigger than any current fact, project or person. It has always been our contention that fundamentally this was a question of mutual trust by citizens and officials. It is conceivable that the attitude of the city officials emanated from a misconception of the motives and purposes of this organization. Now that our position and motives have received recognition in Judge Crothers' decision, it is our hope that the authorities will recognize the place of the bureau as a citizens' agency whose sole actuating purpose is to serve the public as a whole and act as a staff organization in co-operation with officials of the city. Our only desire is to learn the truth in regard to Hetch-Hetchy, and our desire is now and always has been to give to the Hetch-Hetchy project a clean bill of health if the facts warrant it. We sincerely trust that an examination of the records will make this possible. The only purpose of the bureau in making such an examination is to assure the city against waste from error and we trust that the city officials will now see the wisdom of accepting the disinterested co-operation of the bureau to that end."

Commission Government Adopted.

Crystal Falls, Mich.—Commission government won one of the hardest fought battles over the issue that has ever occurred in the upper peninsula when Crystal Falls voted, by a majority of 43, to adopt a commission charter prepared recently by a charter board. The charter was passed despite the efforts of representatives of the mining interests, who set out to beat it, and who were very active in opposition to it. Arrayed against these interests were the business men of Crystal Falls and many of the professional men.

Court Upholds Special Tax District for Civic Center.

Denver, Colo.—The last word in the controversy over the civic center assessments has been given by the supreme court. The decision upholds the city's action in assessing the costs against the taxpayers in the East Denver Park district. Petition for rehearing was denied those who sought to reopen the entire case on the proposition that the Londoner case, decided by the United States supreme court, did not determine the issues involved in the civic center suit. The opinion of the Colorado court was handed down in January, upholding the lower court's decision that the entire city should not be subject to taxation for the civic center. Since then complainants filed an application for rehearing, which is now denied.

City Gives Up Commission Plan.

Janesville, Wis.—Another Wisconsin city has tired of the commission form of government, Janesville having voted to return to the aldermanic system of municipal government. The majority was 350.

TRAFFIC AND TRANSPORTATION

Municipally-Owned Street Railway Successful.

Lincoln, Ill.—City clerk H. C. Mathein, Jr., reports that the service on the electric railway taken over by the city last summer has been greatly improved and the patronage has been good. A profit has been shown each month under the method of accounting prescribed by the Interstate Commerce Commission. There is still a balance in the bond fund and a considerable balance in the operating fund. The property consists of about 8 miles of road serving 10,000 people. At the election held on June 19, 1917, the voters favored by a vote of ten to one to authorize a bond issue of $30,000 for the purchase of the line. During its twenty-five years' of operation the railway changed ownership a number of times. Because of the problem of paving its right-of-way several owners contended that it was a losing proposition. The last owner had a heating franchise, but allowed his contracts for heating public buildings to lapse and in the winter of 1916 he shut down the plant, discontinuing both heating and railway service. Many attempts were made to sell the plant and railway, but no buyer could be found. After the property had been idle several months, the Lincoln Commercial Club, the merchants of the city and the city officials, after a strong campaign, convinced the people that municipal ownership was the only means of keeping the railway in operation. The sum of $11,500 was paid for the plant, equipment and rolling stock, much of which was little more than junk, and $1,650 was paid the owners of the extension line for their track to the cemeteries and to Chautauqua Park. The mayor took control of the management and operation of the system, and the auditing, accounting, etc., is done by the city clerk. Three used cars, in very good condition, were purchased, and the plant and tracks put in running condition. After about a month, it was found that the manufacture of power with the old machinery was very expensive and it was decided to dismantle and discontinue the operation of the plant. Power was purchased from the Illinois Traction System for a period of about two and one-half months when a contract was entered into with the Lincoln Water & Light Company, a privately-owned local corporation, for power for a period of ten years at a much lower rate than it could be generated by the city itself or purchased by it elsewhere.

City to Appeal 6-Cent Fare Decision.

Portland, Ore.—Portland will for the present continue to pay a six-cent fare. The six circuit judges of the Multnomah county courts have held that the act of the state public service commission in granting the Portland Railway, Light & Power company an increase of fare was legal. That the city is created by the state just as the state is created by the federal government and that the city has no right now to overrule the public service commission is in effect a summary of the decision. The city commissioners have directed immediate steps to appeal from this decision to the state supreme court. The decision makes it plain that none of the judges attempted to go into the justice or reasonableness of the six-cent fare as viewed from a common or public viewpoint, the law alone being the basis of the decision. The law enacted by the legislature and approved by the people creating the public service commission gives the commission full power over the street railway fare question and all other questions of a public utility nature, the judges find. The judges agree that the people erred in granting the railway company its original franchise bare of a stipulation that did not say what should be the maximum fare to be charged by the corporation. The decision said:

"Under charter provisions the city granted franchises. They were duly accepted by the grantees in writing. Each franchise contained a provision, in substantially identical terms, that the grantee could charge and collect the sum of 5 cents and no more for each passage in one general direction. Provision for the regulation of fares by the council was omitted from practically all of the franchises. Did this delegation of power enable the city to bind the state to a rate of 5 cents—neither more nor less—during the entire life of the franchise? Did the state by this delegation surrender its power of regulation? The delegation to grant franchises is in general terms. It contains no provision regarding rates. The only reference to rates is in section 112, and that section contains no words of grant, but provides that every franchise shall contain a provision fixing the maximum fare to be charged. The provision of section 112 relating to fares is a direction that the city must insert in every such franchise the maximum rate of fare that can be charged by the grantee during the life of the franchise. This is not a grant of power to fix an unalterable rate, as against the state, but is a limitation on the power of the city to grant franchises without fixing the maximum rates of fares therein.

"Section 2207, Lord's Oregon laws, prohibits under penalties any street railway company in cities having a population of more than 50,000 inhabitants from charging a fare of more than five cents for any one continuous passage in any one general direction within the corporate limits. This law, general in terms but local in operation, was enacted in 1901. We are of the opinion that this law has been repealed by necessary implication by the public service law. We have already shown that the public service act amended or superseded all municipal charters of the state in conflict with its provisions. It is a well-recognized rule that a comprehensive later statute repeals a prior statute where they are in conflict, or where a general later act includes the entire law on the subject on which the prior act covered only a part. It certainly appears that the public service act embraces the whole subject of rates for public service, and that it was the plain purpose of the framers to give expression to the whole law therein. The two acts cannot be harmonized, the repugnancy is clear, and the prior statute was repealed by necessary implication.

"The public utility act went into effect when it was approved by the people under the referendum of November 5, 1912. It was proclaimed by the governor November 29, 1912. The charter amendments in question were submitted to the people for adoption at the election of May 3, 1913. So the public utility law was in effect when these amendments were submitted and adopted. If these regulations are in conflict with the provisions of the public utility law, they fail, and if they do not conflict they are immaterial in this controversy. Judge Bean has held that these very amendments were invalid, in view of the public utility act in force when they were adopted. In holding them invalid he used this language: 'It is clear, therefore, that both cannot stand. One or the other must give way. There cannot be two public bodies existing at the same time with original jurisdiction to prescribe and fix the only lawful rates to be charged by a public utility. The public utility act was passed by the legislature and approved by a majority of the people on a referendum vote. It is therefore the expressed will of the sovereign power of the state concerning a subject over which it has jurisdiction, and it cannot be amended or abrogated by the people of a particular or given locality.'"

Fare Reduction by City Car Line.

Seattle, Wash.—Councilman Erickson has announced that within two months the fare on the city-owned railway between Third avenue and Pine street and Leary avenue and Market street in Ballard will be reduced to 3 cents. The decision of the council comes in the face of a previously announced fact that the city's municipal railway lines were operated between June 1, 1914, and February 1, 1918, at a loss of about $150,000. Within two months the city expects to receive half a dozen or more one-man cars, and they will be utilized in the equipment of the 3-cent route which measures a fraction less than 5½ miles. Councilman Erickson points out that the line between Pine street and Market street will relieve the congestion on the system as a whole, and that a ride for 3 cents will attract the patronage of those who now walk a dozen or more blocks rather than pay a 5-cent fare. The municipal railway was operated during the fiscal year 1917 at a net loss to the city of $34,958, according to the annual report of superintendent of public utilities, A. L. Valentine. The report shows that the loss on Division A was $26,458 and on Division C $8,480. Passenger revenue on Division A amounted to $25,097, and the total revenue obtained from the line was $28,081. The operating expense for the year was $54,539, this including an item of $19,125 as interest on the funded debt. Revenue on Division C amounted to $24,521, and the operating expense totaled $33,001.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Police Power—Wooden Buildings in Fire Limits.

(Tex. Civ. App.) Ordinance making it unlawful, "except when otherwise ordered by the board of commissioners," to erect wooden buildings within certain limits is valid, and confers power upon commissioners, by issuing building permit, to authorize building of wooden structure within limits specified.—Focke, Wilkens & Lange v. Heffron, 197 S. W. 1027.

Police Power—Sand Pit in City.

(Iowa) In suit to enjoin operation of sand pit within plaintiff town as a nuisance, held that part of decree enjoining violation of ordinance with reference to digging of any pit, etc., will be reversed, ordinance being arbitrary.—City of Hawarden v. Betz, 164 N. W. 775.

Negligence in Collection and Paying Funds—Defense.

(Or.) Action against a city for negligence in collecting and paying out special paving fund, from which plaintiff was to receive payment, cannot be defeated on ground that charter indebtedness limitation forbade incurring indebtedness for plaintiff's payment.—Morris v. City of Sheridan, 167 P. 593.

Hight Tension Wires—Damages—Action.

Georgia.—Action by landowner for damages from unauthorized maintenance of high tension wires over his lands, with prayer for damages and the abatement of nuisance by removal of wires from his property, is not an equitable action within Civ. Code 1910, § 5499.—Fuller v. Georgia Ry. & Power Co., 94 S. E. 249.

Assigned Contract—Paving—Appropriation of Material.

California.—Assignee of contract for street paving might waive contractor's wrongful appropriation of material along the street purchased of contractor by the assignee, and claim its value as under an implied contract therefor.—Hoare v. Glann, 168 P. 346.

Excavation—Sinking of Structures.

Iowa.—One can excavate as long as the soil of an adjoining landowner would not sink away of its own weight, and no liability is incurred if it sinks by reason of structures thereon.—Starett v. Baudler, 165 N. W. 216.

Excavation—Protection of Adjoining Structures.

New York Sup.—Contractors and subcontractors employed to make excavation held not liable for failure to comply with New York Building Code, § 22, as to protecting adjoining walls or structures.—Gordon v. Hedden Const. Co., 167 N. Y. S. 584.

New York Sup.—New York City Building Code, § 22, requiring persons making an excavation to preserve adjoining or contiguous walls or structures, held to include walls or structures near or close to the excavation, though not touching it.—Gordon v. Automobile Club of America, 167 N. Y. S. 585.

Where defendant made excavation on land of B., between land of defendant and plaintiff, in protecting B.'s building from an excavation on its own land, held, New York City Building Code, § 22, required it to protect plaintiff's building.—Id.

New York Sup.—Any person, having a special interest in observance of duty imposed on persons making excavation to protect adjoining walls by New York City Building Code, § 22, held entitled to sue for damages sustained by its violation.—Gordon v. Automobile Club of America, 167 N. Y. S. 585.

County Clerk—Additional Compensation.

Virginia.—County clerk was not entitled to interest on unpaid balances of salary and stationery allowances.—Board of Sup'rs of Culpeper County v. Coons, 94 S. E. 201.

Under Acts 1891-92, c. 477, held clerk of court was not entitled to compensation in adition to salary for indexing deeds, etc., docketed in his office during his term pursuant to court order requiring more extensive system.—Id.

That court allowed and board of supervisors approved payment of similar claims would be immaterial in determining whether county clerk's claim for compensation in addition to salary was properly refused.—Id.

Contract—Improper Influence on Official.

West Virginia.—If the performance of the obligation of a contract furnishes temptation to use improper influence with a public official, the contract is illegal, and no right or obligation can be founded upon it.—Kaufman v. Catzen, 94 S. E. 388.

Bridge Repairs—Adjoining Towns.

Minnesota.—Contract between adjoining towns to jointly repair bridge on road between them, held valid under Gen. St. 1894, § 1824, notwithstanding bridge was on part of highway wholly within plaintiff town, that town line was also county line, and that contract was silent as to its duration.—Town of Mt. Pleasant v. Town of Florence, 165 N. W. 126.

Contract—Uncertain Language—Construction.

Oklahoma.—Where language of a contract is uncertain and parties by their acts construe it alike, and within purview of construction permitted as best by such language, courts will ordinarily follow such adopted construction.—Board of Com'rs of Pottawatomie County v. Henderson, 168 P. 1007.

Crossing Power Wires—Care.

Kansas.—Where street railroad wires, electric light, telephone, and telegraph wires cross each other, those maintaining them must use highest degree of care commensurate with danger by using such appliances as are practicable to prevent contact of wires if any should break or fall.—Lewis v. Harvey, 168 P. 856.

Elections—Closing of Polls—Booths.

Oregon.—Law requiring polls to be kept open to 8 p. m. is only directory and avails nothing in absence of showing that electors were deprived of right to vote, and that number excluded was sufficient to change result.—Links v. Anderson, 168 P. 605.

That there were no booths at polls is not ground for contest of election, under Laws 1911, relating to irrigation districts, in absence of showing of intimidation or failure to cast free ballot.

Electric Plant—Lighting Service.

Under its charter, held, that an electric light and power company could not, under a private grant, provide street lighting service and supply current for private consumption in a town without consent of the town board.—People ex rel. Oneonta Light & Power Co. v. Public Service Commission, Second Dist., 167 N. Y. S. 486.

In view of Public Service Commissions Law, § 2, subd. 12, defining the term "electric plant," an electric company, attempting under private grant to dispose of current to private consumers, is "beginning construction of an electric plant," within section 68, giving the Commission authority to supervise construction.—Id.

New York Supp.—Although an electric light and power company had a private grant of way to construct its lines, the Public Service Commission, under the Public Service Commissions Law, § 68, requiring the consent of the Commission to construction work, had the power to supervise the construction of its lines.—People ex rel. Oneonta Light & Power Co. v. Public Service Commission, Second Dist., 167 N. Y. S. 486.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d street, New York, N. Y.

March 27-28.—INDIANA SANITARY AND WATER SUPPLY ASSOCIATION. Annual convention Claypool Hotel, Indianapolis. Secretary, W. G. Ulrich, Indianapolis Water Company.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

Vermont Society of Engineers.

More than fifty members of the Vermont Society of Engineers held their sixth annual business meeting and banquet in Burlington March 13.

At the opening session in the morning there was an election of officers and committee reports were read. The officers chosen were: President, B. M. Hayward of Montpelier, research engineer of the Central Vermont railway valuation department; vice-president, J. W. Votey, of Burlington, dean of the college of engineering at the University of Vermont; vice-president (elected last year for two years), C. F. Purington, of Burlington, manager of the Leader Evaporator company; secretary, G. A. Reed, of Montpelier, assistant state engineer; treasurer, L. F. Dix, of Northfield, professor of civil engineering at Norwich University; directors, C. A. Slayton, of Morrisville, superintendent of Morrisville Electric company; directors (elected last year for two years), F. W. Dennison, of St. Albans, assistant engineer of the Central Vermont railway; E. D. Blackwell, of Brandon, electrical engineer.

The committee on public policy urged better delivery from various railroad terminals of the state. The committee on roads and pavements and their development in Vermont strongly advocated the rebuilding of the highways of the state in view of the military needs. Prof. F. E. Austin, of Hanover, N. H., spoke on the electrification of railroads. H. D. Larrabee, of the Tenney Electrical company at Montpelier, read a paper on "Power Development in Vermont." For the committee on railroads and structural engineering, F. R. Stevens of the valuation department of the Rutland railroad, spoke on "Valuation Work." Prof. L. E. Dix, of Northfield, reported for the committee on sanitation and public health, taking as his subject "Sewage Purification by Electricity."

A most interesting address was given at the afternoon session by Capt. G. L. Byrode, professor of military science and tactics at Norwich University, his subject being "To the Trenches and Back in Less Than an Hour."

"Modern Fireproof Buildings" was the subject of an address at the evening session by Charles H. Nichols of New York, in a lecture hall at the University of Vermont. His lecture was illustrated with views of constructional works, drawings of buildings already erected and to be erected soon.

A. E. Winslow, the retiring president, gave his annual address, taking for his subject "The Engineer of To-day," following the lecture by Mr. Nichols, and this lecture closed the session.

A banquet was held at the Hotel Vermont at 6:30, just preceding the evening session.

International Fire Fighters' Union.

At a recent convention held in Washington, D. C., the International Fire Fighters' Union was founded and organized.

"The object of our new organization is not to stir up agitation or factional feeling, but to strive for the betterment of our working conditions and the improvement of the service," according to a statement by one official. "Strikes are unconstitutional under the constitution adopted. Formerly we operated as local unions under the federation plan; now we have our own international organization with headquarters at Washington, D. C. Later we will work out the matter of insurance and sick benefits in our order in the same manner that the other big brotherhoods of national importance are conducted."

The country was divided into 12 districts, from each of which a vice-president was elected. These vice-presidents are the board of directors of the international. Thomas Spellacy of Schenectady, N. Y., was elected president. W. A. Smith, of Washington, D. C., was elected secretary.

The convention selected Colorado Springs as the place for the next annual convention, the second Monday of September, 1919.

Texas Members American Society of Civil Engineers.

Dallas was selected as the future headquarters of the Texas Association of Members of the American Society of Civil Engineers at its recent annual meeting held at the University Club. It was decided that the activities of the association should continue during the war, and annual meetings will be held here until otherwise ordered by the board of directors.

The following officers for 1918 were elected: R. C. Gowdy, of Fort Worth,

(Continued on page 254.)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Cresbard, S. D., is to build WATERWORKS. The engineering firm of Smith & Loomer is in consultation on the improvement.

SEWERS and a DISPOSAL PLANT are to be built by Sun Prairie, Wis. The consulting engineering firm of Reichardt & Pierce prepared plans.

Montezuma, Ia., is to construct an outlet SEWER and SEWAGE TREATMENT PLANT. Plans and specifications for the improvement were prepared by John H. Dunlap.

A SEWAGE DISPOSAL PLANT and SANITARY SEWERS are to be built by Lebanon, Pa. The designing and consulting engineer for the work is James H. Fuertes.

The Muscatine Island Levee District, Muscatine, Ia., is receiving bids for extensive LEVEE construction. Plans and specifications for the work were prepared by the firm of Elliott & Harman.

Construction of WATER MAINS is proposed for the town of Bellingham, Mass. The engineer for the work is Willard Kent.

Lebanon, O., is to build a SEWAGE DISPOSAL PLANT. Plans for the work have been completed by the engineer, Robert E. Kline.

Beaver County, Beaver, Pa., is to make BRIDGE REPAIRS according to plans prepared by the Farris Engineering Co.

Improvements are being considered for the ELECTRIC LIGHT PLANT and WATERWORKS of Shattuck, Okla. Preliminary plans are in the hands of Burns & McDonnell.

Norfolk, Va., is considering the purchase of the local property of the Norfolk County Water Co. W. E. Chester has been retained as consulting engineer to investigate the WATER situation and make a VALUATION of the plant.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is a tendency to cut about $2 a ton on 6-inch and $1.50 on 4-inch where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A, $1 extra.

The advertising department of **The Harrison Works,** owned and operated by **E. I. du Pont de Nemours & Co.,** located at Wilmington, Del., is sending out to the trade a series of twelve handsomely illustrated calendar-blotters. Each blotter in the series makes paint-creating thought for the consumer or property owner, and shows pictures of houses, rooms, floors or automobiles which have received proper painting and are, accordingly, very attractive. The edition of these blotters runs close to the million mark, the art-work is high grade and the printing is four-color process. One of the important side-issues is the education of the dealer to the idea of driving hard for increased paint sales every month in the year, and not in seasons only.

Construction Work in Belfast, Ireland.—According to consular reports, one of the most perplexing questions with which the corporation has ever had to deal is that relating to the disposal of sewage. The foreshore nuisance, of which complaints come from the residents on the County Down shores of Belfast Lough, causes great anxiety. The new ferroconcrete outlet sewer, which was commenced in 1913, is not yet finished. The work of constructing new sewers and renewing old ones which have become defective involves annual expenditures by the city corporation.

Improvements relating to the widening, straightening, or extending of streets are always in progress here. The surface of the streets is being gradually improved, and it is noticed that the "kidney" pavers are disappearing, and material more conducive to the comfort of the community is being substituted. Wood blocks or tarred macadam is being used for the making of roads near schools and churches, in order to deaden the sound caused by heavy traffic. Street works under the Belfast corporation act of 1911 cost $347,531; improvements under the Belfast improvement order of 1910, $577,527. These schemes are still in progress.

The question of making provision to meet the rapidly expanding business of the electricity department has been considered by the corporation since early in 1911. The proposed building of additional electrical works to supplement those now existing has received very close attention. The decision to proceed with the new works was unfortunately rendered impracticable for financial reasons by the war.

A new water supply system is partly constructed, but on account of the conditions nothing is being done at present. The new works when completed will serve about 800,000 persons. The outlay at present is $10,321,997. An additional sum of $2,433,250 or thereabouts will be required to complete the plant.

Notice has been given that application will be made to Parliament by the Belfast harbor commissioners for leave to bring in a bill and pass an act for the construction of new works to improve the harbor at Belfast. The principal feature of the scheme is the proposed construction is a series of docks. An important part is that relating to the deepening and extension, by excavation, dredging, or otherwise, of the canal for navigation. It is proposed to construct wharves, jetties, and quays, and, with a view to meeting the requirements of future developments in the shipping industry, the construction of a new loading dock. If the scheme were carried out in its entirety an expenditure of more than $9,733,000, it is stated, would be involved; but there will be a marked fluctuation in the cost of labor and materials after the war, and any estimate which might be given now would be largely speculative.

[A list of engineers, builders, mill companies, and officials in charge of public works in the Belfast district may be obtained from the Bureau of Foreign and Domestic Commerce, its district or cooperative offices. Refer to file No. 95503.]

Auto Trade Reduces Production 30 Per Cent.

A curtailment of 30 per cent in automobile production for the present year is the latest important action taken by the members of the National Automobile Chamber of Commerce. Many of the large plants have already curtailed their production of motor vehicles to a larger extent, in view of taking over the munitions work for the Government. Hugh Chalmers, vice-president of the National Chamber, states that the voluntary 30 per cent curtailment is entirely satisfactory to the War Industries Board and the Fuel Administrator. The National Automobile Chamber of Commerce is composed of 117 motor manufacturers, and nearly all of the large plants were represented at the meeting. It was voted at the recent meeting to dissolve the Automobile Industries Committee and to maintain in its stead a general headquarters in Washington in charge of Hugh Chalmers. Mr. Chalmers was a member of the former committee, which was formed last November to assist the War Industries Board in the selection of factories best adapted to the making of various forms of war munitions while maintaining the efficiency of the plants for the necessary motor requirements of the country. A staff of engineers will be kept at the national automobile headquarters to aid manufacturers in their work for the Government.

NEWS OF THE SOCIETIES

(Continued from page 253.)

president; R. J. Potts, of Waco, first vice-president; Hans Helland, of San Antonio, second vice-president; J. H. Brillhart, of Dallas, secretary and treasurer. These officers, together with the retiring president, J. M. Lowe, and C H. Chamberlin, of Dallas, constitute the board of directors. Professor R. G. Tyler, of the University of Texas, read a paper on "Purification of Sewage by Aeration in the Presence of Activated Sludge." J. C. Nagle, dean of the school of engineering of the A. & M. College, reported on and read some literature bearing on proper legislation for licensing engineers for the protection of the profession and the public. Major Rothrock of the Quartermaster Department of the Army, who was present as a visitor, entertained the meeting with a history of the rapid and efficient work done in constructing the cantonment at Camp Logan, Houston, and Terrell Bartlett read a paper on the relation of rainfall to run-off.

Flint Municipal Engineering Society.

At a recent meeting the Municipal Engineering Society of Flint, Mich., elected E. C. Shoecraft president and Robert Knapman secretary. The society's membership is made up of men in the department of engineering of the city.

PERSONALS

Bascom, Harry F., is now city engineer of Allentown, Pa.

Goss, W. R., has resigned as superintendent of the water and sewer system of Shreveport, La.

Smith, John H., resigned as head of the state engineering department of Idaho.

Solomon, Gabriel, of the consulting engineering firm of Solomon-Norcross Co., Atlanta, Ga., has been commissioned major in the Engineer Reserve Corps and assigned to the engineering staff of the cantonment division. Mr. Norcross is supervising engineer at Camp Humphreys, Belvoir, Va. The firm of Solomon-Norcross Co. has been engaged in cantonment work for the Government on a number of camps in the South and West. The general practice of the firm will be continued as heretofore with headquarters in Atlanta.

Tolman, Mayo, chief engineer of the West Virginia department of health, has gone to Guatemala for three months for American Red Cross. He will engage in relief work made necessary by the recent earthquake. Mr. Tolman has not resigned his state position but has received a three months' leave of absence.

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OPERATION OF SEWAGE WORKS IN IOWA*

Conditions Found by Author at Thirty-nine Plants—Inefficient Operation Due to Lack of Funds, Ignorance and Carelessness—Sedimentation, Septic and Imhoff Tanks, Sand Filters, Sprinkling Filters and Contact Beds.

By J. H. DUNLAP.†

Two characteristics of Iowa must be kept in mind in considering the operation of sewage works in this State. In the first place, the population of Iowa is widely scattered among about 2,300 cities, towns and villages, of which 892 were reported in 1915 as cities and incorporated towns. Of these 892 cities and incorporated towns 15 are cities of the first class with populations of 15,000 or over; 85, cities of the second class with populations from 2,000 to 15,000; and 792 incorporated towns with populations less than 2,000. It is interesting to note that there are in Iowa about 450 water works systems, 182 sewerage systems, and 102 sewage treatment plants. Forty-two of these 102 sewage treatment plants are in towns of less than 1,300 population. Mason City with a population of 17,152 in 1915 is the largest city to construct a sewage disposal plant.

In the second place, towns in Iowa are situated for the most part either upon unimportant water courses or upon none at all. Most of the sewage treatment plants now built discharge their effluents either into small creeks or into drainage ditches which dry up nearly every summer.

The importance of these two characteristics of Iowa is plain. The large number of little towns having sewage treatment plants means neglect of the plant, since the administration of the affairs of small towns is apt to be carried on by men who have neither time nor inclination to give proper attention to the management of a sewage treatment plant. The second fact, the lack of large streams, or as is frequently the case, the lack of any streams at all, requires efficient management of sewage treatment plants if nuisance is to be avoided.

The law in Iowa requires high standards of purification. Section 4979, Supplement to the Code of 1913, provides as follows:

> If any person throw, or cause to be be thrown, any dead animal, night soil or garbage into any river, well, spring, cistern, reservoir, stream or pond, or in or upon any land adjoining, which is subject to overflow, he shall be imprisoned in the county jail not less than ten nor more than thirty days, or be fined not less than five nor more than one hundred dollars.

The State Board of Health, with the approval of the Attorney-General, has interpreted this section in its Rules

TWO SAND FILTERS AT ALBIA.

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*Paper before the Municipal Engineering Section of the Iowa Engineering Society.

†Associate Professor of Hydraulics and Sanitary Engineering, State University of Iowa, Iowa City, Iowa.

ALBIA. TWO IMHOFF TANKS WITH FLAT SLAB COVERS.

and Regulations, Chapter VII, Rule 1, Section 1, as follows:

> No person, firm, corporation, public institution or municipality shall discharge, or permit to be discharged, into any lake, pond, natural or artificial depression or reservoir, river or other water course of this State, or deposit or cause to be deposited upon any land subject to overflow, any untreated domestic sewage, industrial sewage or garbage, or any other domestic or industrial refuse or any other noisome substance whatsoever, or the effluent of any sewage treatment plant which does not conform to the standards of purification established by the State Board of Health in its supervision of the operation of such sewage treatment plants.

Now, it is one thing to put a law upon the statute books, and it is quite another thing to carry it into effect. For years the Iowa State Board of Health has been endeavoring to secure sufficient appropriations so that this law, as well as other important sanitary legislation, may be enforced. Thus far it has been possible to secure financial provision for only one sanitary engineer for the State Board of Health. It is safe to say that at least three men ought to be employed instead of one.

During the last summer the State Board of Health found it possible to employ the writer for about three months for the purpose of inspecting water works, sewer systems and sewage treatment plants. Of the 102 sewage treatment plants in the state it was found possible to visit only 39 plants, located in 32 different cities and towns. In addition to this, three sewage treatment plants at state institutions were inspected.

The following types of plants were found: Twenty-four with preliminary sedimentation tanks and intermittent sand filters; eight with two septic tanks without sand filters; two with septic tanks and contact beds; one with two septic tanks and a sprinkling filter; one with one Imhoff tank and a sprinkling filter; one with two Imhoff tanks and three contact beds; one with one septic tank and a sewage pond; one with one Imhoff tank without sand filters. Of the 24 plants with sedimentation tanks and intermittent sand filters, 8 had sedimentation tanks of the Imhoff type. Of the latter, two plants had two Imhoff tanks; the remaining six, one Imhoff tank each. .Discussion will be confined to operation of plants with sedimentation tanks, or with tanks and intermittent sand filters, since 32 of the 39 plants inspected were of this type.

Now, of all these 39 plants not one can be scored 100 per cent efficient. Of course the conditions found at the time of the visit may not do some of these plants justice. Seemingly every possible variation from perfection was found. A summary of the actual findings at the 24 plants with both sedimentation tanks and sand filters may prove instructive. Unless otherwise stated, each plant has two septic tanks and two sand filters. The populations given are those of the 1915 census.

Ackley, population 1,289. The filters were weedy, the sand ridges between the two beds were broken through and there were holes in the filters leading directly to the underdrains. Care had been insufficient.

Albia, population 5,138. The two Imhoff tanks were found to be miniature septic tanks. The slot connecting the sedimentation chamber with the sludge chamber had been clogged up and the sedimentation chamber was well sludged up. The flat slab covers made it practically impossible to operate the Imhoff tanks properly. The filter beds were somewhat out of level, and the distribution was uneven. The plant had been receiving insufficient care.

Ames, population 5,091 (city plant). Both filters were flooded with sewage, due to too high a rate of filtration.

Carroll, population 4,031. The plant consists of two septic tanks and five sand filters. The filter beds have about reached their normal capacity. The plant was in excellent condition with the exception of some trouble with the siphons. The plant receives regular, intelligent care.

Chariton, population 5,235. The three plants, each with one Imhoff tank and two intermittent sand filters, were completely neglected. The flat slab covers made the Imhoff tanks quite inaccessible.

DeWitt, population 1,877. The filters were overloaded and slightly weedy. With these exceptions the plant was in first-class condition, since it receives excellent, regular care.

Fairfield (southeast plant), population 6,113. The plant consists of one Imhoff tank and three sand filters. The Imhoff tank was found to be a miniature septic tank, since the connection between the sedimentation chamber and the sludge chamber had become clogged and the sedimentation chamber had become well sludged up. The flat slab cover made it difficult to keep the Imhoff tank in good operating condition. The grit chambers were misunderstood. The filter beds were being operated with no ridges between the three filters. The wooden distribution troughs were in bad condition. The plant had not been receiving proper care.

Fairfield (northeast plant). The type of plant and the conditions found were the same as at the southeast plant just described.

Grinnell, population 5,061. The plant consists of two Imhoff tanks and four sand filters. The two Imhoff tanks were found to be sludged up. The sedimentation chambers were miniature septic tanks. The distribution upon the sand filters was found imperfect. Trouble was experienced in removing sludge from the tanks, since no water connections were available. The plant was receiving regular but not intelligent care. The flat slab covers have now been removed.

Knoxville, population 3,541. The two filter beds were badly overworked. The tile distribution lines needed attention. The siphons have always caused trouble. The plant receives excellent care.

Lake View, population 814. The two filters were somewhat weedy, and soil from the banks was being washed down upon the surface of the beds. The outfall wall was being undermined. The plant was receiving care every two weeks.

Lisbon, population 879. The filter beds needed weeding; the distribution over the beds needed correcting; some repairs were necessary upon the distributors. No care is given the plant.

Marion (new plant), population 4,675. The two filters showed uneven distribution of sewage. The siphons were giving trouble. Since there is no sludge bed the sludge from the septic tanks is flushed directly into the creek.

Mount Vernon, population 1,568. The two sand filters were badly overworked. With no sludge bed available, the custom is to sludge the septic tank directly into the creek. The plant has excellent care.

Nevada, population 2,686. Both filters were being bypassed at the time of visit. One filter was still flooded from high water in the creek. The filter beds were badly

AMES. TWO SAND FILTERS FLOODED.

overworked, operating at at least three times the normal rate. In winter the beds are by-passed. The plant receives regular care.

Newton, population 5,165. Serious trouble with gas waste had put both the Imhoff tank and the two filter beds out of commission. The Imhoff tank had been improperly constructed in the first place, with holes at the bottom of the sedimentation chambers instead of continuous slots. The flat slab cover has been removed.

Oelwein, population 7,137. The plant consists of two septic tanks and four sand filters. The filter beds were badly overworked. The plant receives regular daily care.

State Center, population 1,037. The filter beds were by-passed at the time of the visit. The beds needed cleaning, and the banks needed seeding. The plant receives no regular care.

Sumner, population 1,585. The plant consists of one septic tank and two sand filters. The filters were permanently by-passed, since they had been constructed with their drainage system too near the level of the creek.

Tipton, population 2,176. The filter beds were badly overworked. They had been flooded recently and the plank distributors floated out of place. With no sludge bed, the septic tanks are sludged directly into the creek. The filters are by-passed in winter. The plant receives little care.

Toledo, population 1,721. Both filter beds were found flooded from high water in the creek. In winter the plant is by-passed. It receives no regular care.

West Liberty, population 1,760. The two sand filters were badly overworked. Due to trouble with the siphons, one bed was receiving more than its share of the sewage. The beds were uneven on the surface and badly clogged. The sludge from the septic tanks is flushed directly into the creek. In the winter the plant is apparently by-passed. The care received is negligible.

With this general survey in mind of all the plants visited, it may be interesting to imagine now a composite plant, made up of all of those described. Some of the weaknesses of this composite Iowa plant, viewed from the operating standpoint, will now be presented. One caution is necessary. Such suggestions as will be made are offered in no spirit of destructive criticism. Of course many of the defects found are due solely to the inadequate funds available at the time of construction. The discussion will follow this order: first, grit chambers; second, septic tanks; third, Imhoff tanks; fourth, sludge beds; fifth, siphon chambers; sixth, intermittent sand filters.

1. GRIT CHAMBERS.

Grit chambers must be so made that all parts are readily accessible. Flat slab covers, close to the surface of the sewage, with insufficient openings, must be done away with.

Grit chambers must be thoroughly cleaned after each storm, and at least once a week in dry periods. Therefore, adequate means for flushing out their contents must be provided. Grit chambers under conditions in Iowa, whose contents must be removed by lifting them out of the top of the chambers, are naturally seldom cleaned. Accordingly, they soon become small septic tanks and are worse than useless. The valves upon these grit chambers should be so made that they are easily operated.

CARROL. TWO SEPTIC TANKS AND FIVE SAND FILTERS. SLUDGE BEDS IN FOREGROUND.

FAIRFIELD. IMHOFF TANK WITH FLAT SLAB COVER.

(To be continued.)

THAWING SERVICES AT LAWRENCE.

At Lawrence, Kan., as in many other cities in that section of the country, many water works services were frozen during the extreme cold of last winter. In that city about 100 services were frozen, of which about 40 were thawed by use of electricity. How this was done is described for us by E. H. Dunmire, superintendent of water works and city engineer.

The department borrowed a 2,300—220 and 110-volt transformer from the local electric lighting company, and two resistance boxes from the electrical department of the university, and purchased about 1,200 ft. of No. 8 insulated wire. The services thawed varied in length from 25 ft. to 100 ft., and required the actual use of the current for from 5 minutes to 1½ hours. The full capacity of the transformer was used, stepped down to 110 volts. The amperage varied from 70 to 110, depending usually on the length of wire that it was necessary to use.

All of the equipment was placed in one wagon, which was used as a trailer to a small auto truck. This was taken to the point nearest to the services to be thawed where it could be installed, and was connected by the local electric light company's man, for whose services the city paid 60c per hour for the time required to connect up the wires. It also paid the company 10c per hour for current, with a minimum charge of $1.00 for each connection. After the connection had been made the equipment was left in charge of two employees of the water department, who were paid 35c and 28c per hour. These men laid out the wire and connected it to the services and guarded the apparatus until the service was thawed. The electric light company's man was then called to disconnect the transformer from the primary line and accompany the equipment to the next place where there were services to be thawed.

With this arrangement and procedure the department was able to thaw about 12 services a day. The average cost of thawing the 40 services was about $3.25.

CITY MANAGERS AND THEIR SALARIES.

The Secretary-Treasurer of the City Managers' Association, Harrison G. Otis, manager of Auburn, Me. (until recently manager of Beaufort, S. C.), has compiled a list of city managers that is believed to be correct up to March 1st, and which is reproduced below. This list will be published in the year-book of the association, which will be in the printer's hands in a few days. If any of our readers find any errors in this list, or know of any changes made since the data therein were reported, or of any additional cities that should be added, we hope that they will inform Mr. Otis at once, in order that the list as published in the year-book may be as nearly correct as possible.

There are 118 cities in the list, the populations varying from a minimum of 500 (Largo, Fla.), to a maximum of 142,000 (Grand Rapids, Mich.). It will be seen that in quite a number of these cities the city manager plan has been in operation for less than a year, and the number in which it goes into effect this year indicates the growing popularity of this form of government.

The salaries appear in general to be fairly high, more than one-half of the 93 reported being $2,000 or more, while 13 are $5,000 or more. Two thousand dollars, of course, is a small salary for an important executive position, but considering the small size of most of the communities that are paying this amount or less, the salary may be considered a fair one. Twenty pay $2,000 or more but less than $3,000; 15 pay $3,000 or more but less than $4,000; 9 pay $6,000 or more, 6 pay $7,000 or more, and 4 pay $8,000 or more. The subject of salaries is discussed editorially on another page.

Municipalities Under Manager Plan, March 1, 1918.

Note.—By "Manager" is meant, "Any person who is the administrative head of a municipality appointed by its legislative body." (By-Laws City Managers' Association, Art. 1.)

City.	Population, 1918.	In Effect.	Manager.	Appointed.	Salary.
Auburn, Me.	17,000	Feb. '18	H. G. Otis	Feb. '18	$3,600
Norwood, Mass.	12,500	Jan. '15	....	......	....
Waltham, Mass.	30,000	Mar. '18	C. A. Bingham	Mar. '18	5,000
Newburgh, N. Y.	30,000	Jan. '16	Henry Wilson	Jun. '16	5,000
Niagara Falls, N. Y.	55,000	Jan. '16	O. E. Carr	Jan. '16	5,000
Sherrill, N. Y.	1,500	May '16	C. A. Brown	May '16	....
Altoona, Pa.	60,000	Jan. '18	H. G. Hinkle	Jan. '18	8,000
Bethlehem, Pa.	15,000	Mar. '18	....	......	....
Edgeworth, Pa.	8,000	Jan. '14	W. M. Cotton	Oct. '17	2,400
Grove City, Pa.	4,000	Apr. '16	Edw. Thomas	Jan. '18	....
Titusville, Pa.	12,000	Dec. '13	H. A. Holstein	Dec. '13	2,100
Charlottesville, Va.	12,000	Aug. '13	H. A. Stecker	Jan. '17	2,000
Farmville, Va.	5,000	Sep. '15	Leslie Fogus	Sep. '17	1,200
Fredericksburg, Va.	7,000	Sep. '12	R. S. Royer	Sep. '17	3,000
Norfolk, Va.	90,000	Sep. '18	....	......	....
Petersburg, Va.	26,000	Sep. '20	....	......	....
Portsmouth, Va.	40,000	Jan. '17	W. B. Bates	Aug. '17	4,000
Staunton, Va.	12,000	Jan. '08	S. D. Holsinger	Jul. '11	1,800
Winchester, Va.	7,000	May '16	A. M. Field	May '16	2,000
Charleston, W. Va.	30,000	May '15	M. J. McChesney	Sep. '17	3,300
Wheeling, W. Va.	44,000	Jul. '17	G. O. Nagle	Jul. '17	8,000
Elizabeth Cy., N. C.	12,000	Apr. '15	J. C. Commander	Apr. '15	1,800
Durham, N. C.	25,000	May '17	W. M. Wilkes	May '17	3,600
Goldsboro, N. C.	11,000	Jul. '17	E. A. Beck	Jul. '17	3,300
Hickory, N. C.	5,200	May '15	J. W. Ballew	Mar. '16	1,500
High Point, N. C.	11,000	May '15	T. J. Murphy	May '17	2,700
Morganton, N. C.	5,000	May '13	W. R. Patton	Jan. '18	1,500
Tarboro, N. C.	5,500	Apr. '15	J. H. Jacocks	Apr. '15	1,500
Thomasville, N. C.	5,500	May '15	J. R. May	......	....
Beaufort, S. C.	3,500	May '15	J. R. Kneebone	Feb. '18	1,500
Rock Hill, S. C.	10,000	Jan. '15	J. C. Barnwell	Jan. '15	2,500
Sumter, S. C.	10,000	Jan. '13	E. S. Shuler	Jan. '17	1,200
Griffin, Ga.	8,000	Dec. '18	....	......	....
Largo, Fla.	500	Jun. '13	G. J. Perkins	Mar. '16	900
Ocala, Fla.	6,000	Feb. '18	J. N. Johnston	Feb. '18	....
St. Augustine, Fla.	6,500	Jul. '15	W. L. Miller	Jul. '15	3,600
Ashtabula, O.	21,000	Jan. '16	M. T. Turner	Jan. '18	....
Dayton, O.	140,000	Jan. '14	J. E. Barlow	Mar. '18	7,500
E. Cleveland, O.	23,000	Nov. '17	C. M. Osborn	Nov. '17	3,600
Gallipolis, O.	6,000	Jan. '18	Edw. E. Myers	Jan. '18	1,500
Sandusky, O.	23,000	Jan. '16	G. T. Lehrer	Apr. '17	3,000
So. Charleston, O.	1,200	Jan. '18	P. H. Cheney	Jan. '18	1,400
Springfield, O.	60,000	Jan. '14	C. E. Ashburner	Jan. '17	6,000
Westerville, O.	3,000	Jan. '16	R. W. Orebaugh	Sep. '17	1,500
Xenia, O.	9,000	Jan. '18	Kenyon Riddle	Jan. '18	3,000
Cynthiana, Ky.	4,000	Dec. '15	Daniel Durbin	Dec. '15	900
Johnson Cy., Tenn.	11,000	Jul. '09	P. F. McDonald	Jul. '09	1,800
Kingsport, Tenn.	8,000	Mar. '17	W. R. Pouder	Mar. '17	3,000
Albion, Mich.	8,000	Jan. '16	A. L. Sloman	Sep. '16	1,500
Alpena, Mich.	13,000	Apr. '16	H. G. Roby	Apr. '16	2,500
Big Rapids, Mich.	5,200	May '14	Walter Willits	May '16	1,200
Birmingham, Mich.	6,000	Apr. '18	....	......	....
Cadillac, Mich.	9,000	Mar. '14	Geo. Johnston	Jan. '18	2,000
Eaton Rapids, Mich.	5,000	Apr. '13	....	......	....
Grand Haven, Mich.	7,000	Apr. '15	I. R. Ellison	Apr. '16	1,800
Grand Rapids, Mich.	142,000	Mar. '17	G. C. Cummin	Mar. '17	10,000
Grosse Pte. Shores, Mich.	1,200	Jun. '16	G. A. Abbott	Jun. '16	1,800
Jackson, Mich.	45,000	Jan. '15	A. W. D. Hall	Apr. '17	4,000
Kalamazoo, Mich.	60,000	Apr. '18	....	......	....
Manistee, Mich.	13,000	May '14	C. E. Ruger	May '14	2,000
Muskegon Heights, Mich.	3,000	Jan. '18	....	......	....
Petoskey, Mich.	6,000	Apr. '16	R. D. Tripp	Mar. '17	1,800
Royal Oak, Mich.	5,000	Jun. '18	....	......	....
Sault Ste. Marie, Mich.	13,000	Dec. '17	J. H. Moore	Dec. '17	3,600
Three Rivers, Mich.	6,000	Apr. '18	....	......	....
Glencoe, Ill.	3,100	Jan. '14	H. H. Sherer	Jan. '14	2,500
Winnetka, Ill.	5,500	Jan. '15	H. L. Woolhiser	Oct. '17	3,000
Anoka, Minn.	2,000	Apr. '14	Henry Lee	Apr. '14	1,200

City.	Population, 1918.	In Effect.	Manager.	Appointed.	Salary.
Morris, Minn.	2,300	Jan. '14	S. A. Siverts, Jr.	Jan. '14	1,800
Pipestone, Minn.	3,000	May '17	F. E. Cogswell	May '17	1,700
Clarinda, Iowa	5,700	Apr. '13	T. A. Wilson	Apr. '13	1,700
Iowa Falls, Iowa	4,000	Apr. '14	J. O. Gregg	Mar. '17	1,500
Manchester, Iowa	3,300	May '16	Thos. Wilson,	May '17	1,440
Mt. Pleasant, Iowa	4,200	Apr. '16	T. W. McMillan	Apr. '16	1,530
New Hampton, Iowa	2,800	'17	....	......	1,400
Webster City, Iowa	6,000	Oct. '15	J. G. Long	Apr. '17	1,800
Bentonville, Ark.	3,600	Sep. '15	Edw. Masoner	Sep. '15	1,500
Hot Springs, Ark.	15,000	Apr. '17	C. H. Weaver	Apr. '17	2,500
Carrington, N. D.	....	May '17	F. J. Beier	May '17	1,200
Clark, S. D.	1,500	May '12	J. E. Smith	Jun. '12	960
El Dorado, Kans.	5,000	Jul. '17	B. C. Wells	Jul. '17	3,600
Wichita, Kans.	55,000	Jun. '17	L. R. Ash	Jun. '17	10,000
Collinsville, Okla.	7,500	Feb. '14	F. A. Wright	May '16	1,500
Madill, Okla.	4,000	'17	H. L. McDuffie	Dec. '17	1,800
Mangum, Okla.	....	Nov. '14	W. F. Hearne	Feb. '17	1,800
Amarillo, Tex.	17,500	Dec. '13	A. D. Armstrong	'17	....
Ballinger, Tex.	....	Jan. '17	....	......	....
Brownsville, Tex.	18,000	Jan. '16	....	......	....
Brownwood, Tex.	7,000	'17	W. E. Dickerson	......	....
Bryan, Tex.	7,000	Aug. '17	J. W. Greer	Aug. '17	2,400
Denton, Tex.	6,500	Apr. '14	P. J. Beyette	Jan. '18	2,000
Lubbock, Tex.	2,000	......	....	......	....
San Angelo, Tex.	15,000	Apr. '16	E. L. Wells	May '16	2,500
Sherman, Tex.	16,200	Apr. '15	O. J. Ellingser	Apr. '16	2,400
Taylor, Tex.	10,000	Apr. '14	....	......	....
Teague, Tex.	5,000	Jan. '15	E. B. St. Clair	Apr. '16	1,700
Tyler, Tex.	15,000	Apr. '15	Clay Hight	Apr. '15	3,000
Yoakum, Tex.	....	Apr. '15	Walter Lander	Apr. '15	2,100
Glasgow, Mont.	5,000	Jul. '16	C. H. Blitman	Sep. '16	2,100
Boulder, Colo.	12,000	Jan. '18	E. O. Heinrich	Jan. '18	4,000
Durango, Colo.	6,000	Mar. '15	A. F. Hood	May '15	1,800
Montrose, Colo.	4,500	Feb. '14	J. E. McDaniel	Sep. '15	1,800
Albuquerque, N. Mex.	14,000	Jan. '18	P. G. Redington	Jan. '18	4,500
Roswell, N. Mex.	8,000	May '14	A. G. Jaffa	'16	1,800
Brigham City, Utah	4,000	Jan. '18	C. O. Roskelley	Jan. '18	....
Phoenix, Ariz.	25,000	Apr. '14	V. A. Thompson	Jan. '18	5,000
LaGrande, Ore.	7,000	Oct. '13	Fred Currey	......	2,400
Alameda, Cal.	30,000	May '17	C. E. Hewes	May '17	4,000
Alhambra, Cal.	9,000	Jul. '15	F. L. Hilton	May '17	2,000
Bakersfield, Cal.	20,000	Apr. '15	F. S. Benson	......	3,000
Glendale, Cal.	8,500	May '14	T. W. Watson	May '14	1,800
Huntington Beach, Cal.	2,000	Jul. '16	G. W. Spencer	Jul. '16	2,400
San Diego, Cal.	90,000	May '15	F. M. Lockwood	May '15	6,000
San Jose	40,000	Jul. '16	T. H. Reed	Jul. '16	6,000
San Rafael, Cal.	6,000	Aug. '15	....	......	....
Santa Barbara, Cal.	18,000	Jan. '18	R. A. Craig	Jan. '18	7,500
Hanford, Cal.	....	Oct. '17	Jay Hinman	Oct. '17	1,800

GARBAGE DISPOSAL IN COLUMBUS

Decreased Amount of Garbage and Decrease of Fats in Same Due to Food Economizing Reduce Income from Reduction Plant—Detail Cost of Operating Plant—Recovering Alcohol from Garbage.

The garbage reduction plant at Columbus, O., is one of the best known of the country and probably the most efficiently operated. It has been described at considerable length in Municipal Journal and more or less extended reference made to it from time to time. The report for 1917 of the superintendent, Thomas D. Banks, indicates that this plant has experienced a number of changes from previous conditions due to prices and practices resulting from the war.

In the first place, the amount of garbage handled during the year was about 21½ per cent less than in 1916 and 25 per cent less than in 1915, owing to conservation of food. In addition to this reduction in total amount of garbage, the amount of grease contained in the garbage was 42 per cent less than that in 1916, or 24 per cent less per ton of garbage. The decrease in tankage was almost the same as that in the total amount of garbage. On the other hand, the market value of both tankage and grease was greater than during the previous year, which resulted in a slight increase of total returns in the tankage, but was not sufficient to overcome the decrease in amount of grease, the amount received for which was about $11,000 less than in 1916. The price received for grease averaged about 7.5 cts. per pound, or $3.40 per ton of garbage treated. The price received for tankage was $10.84 per ton, or $1.108 per ton of garbage treated. Per ton of green garbage, there was obtained 45.22 pounds of grease and 204.28 pounds of tankage.

In view of the decrease in garbage and the resulting loss to the plant, Mr. Banks urges that every effort be made to see that all the garbage is collected and that none is destroyed. This he requested not merely on the ground of revenue to the city, but also because grease and tankage are both of great aid in the prosecution of the war. It has been calculated that one ton of average garbage will yield sufficient glycerine to furnish high explosives for ten 75-mm. shells and soap stock for 125 pounds of laundry soap. From the tankage can be obtained fertilizer containing sufficient plant food, in the form of nitrogen, phosphate, and potash, to raise ten bushels of wheat. He estimates that Columbus garbage would in a year yield glycerine for 111,000 shells, soap stock for more than 1,550,000 pounds of laundry soap, and fertilizer sufficient for raising 117,000 bushels of wheat.

During the year, there were completed the tests of a process for recovering the alcohol from garbage, to which reference has been made previously in Municipal Journal. This showed that at least 4.8 gallons of alcohol could be produced from each ton of garbage. This would give an additional profit in the case of the Columbus plant of about $30,000 a year without reducing the income from the other products, releasing for food purposes 30,000 bushels of shelled corn which is now used in the manufacture of that amount of alcohol. This financial return is based on the present high price of alcohol, and the City Council has been unwilling to spend the money required for installing an alcohol-recovery plant for fear that the price would fall before the money to be invested could be recouped.

The plant used, during 1917, 6,403 tons of coal or 746 pounds per ton of garbage; 125,240 kwh. of electric power, or 7.293 per ton of garbage; and 19,465 gallons of gasoline, or 1.134 gallons per ton of garbage.

The cost of operation of the reduction plant during 1917 was as follows:

	Total Cost.	Cost per ton Garbage.
Supervision	$3,590.00	$0.20906
Clerk Hire	1,003.00	.05841
Labor for Operation	25,891.04	1.50774
Office Supplies	60.28	.00351
Fuel	25,027.04	1.45743
Clothing	15.00	.00090
Mechanical and Motor Vehicle Supplies	1,597.64	.09304
Other Supplies	179.97	.01048
Transportation of Employees	275.00	.01601
Telephone and Telegraph	70.61	.00411
Insurance	81.86	.00488
Taxes and Rent	5.00	.00029
Light and Power	2,145.91	.12496
Other Contractual Service	274.22	.01597
Maintenance Buildings	....	....
" R. R. Tracks	268.43	.01562
" Equipment	6,773.75	.39446
Other Maintenance	112.68	.00656
Total	$71,911.12	$4.188
Actual Production	$79,344.48	$4.621
Actual Cost	71,911.12	4.188
Profit	$ 7,433.36	$ .433

Note: Fixed charges such as interest and sinking fund are not included in above cost.

From a table showing the amount of garbage collected each month, it is learned that each month of the year 1917 showed a decrease from the corresponding month of the previous year, this decrease being greatest in May and least in October. The average for the year was 156.11 pounds per capita. (In 1915 the amount was 218 pounds per capita.) The cost of collection of the garbage was 22.3c per capita. The garbage was collected once a week only, a change from previous years during July, August and September, in which months it had been collected twice a week prior to 1917. The average number of loads collected by each team was two, except that those collecting from hotels made from 2 to 4 loads. The loads averaged 1.21 tons.

In addition to the garbage, the department collected 36,228 loads of rubbish totalling 172,461 yds., which was an increase of 16,649 yds. over the previous year. It also collected 2,504 tons of manure, which was a decrease of 468 tons from 1916. The rubbish was overhauled for valuable matters, and there were recovered from it bottles, paper, tin cans, iron and other scrap metal, rags, etc., which were sold for $3,521.75.

CONNEAUT FIRE DEPARTMENT ITEMS.

We are informed by Thomas J. Gough, chief of the fire department of Conneaut, O., that the members of the department have been given an increase in salary of $15 a month, the increase going into effect on March 1st. The department is now working under the two-platoon system, which was established on January 1st, 1917, and which is reported to be working very satisfactorily for all concerned.

OIL FOR CREOSOTING WOOD PAVING BLOCKS.

The Chicago Specifications and the Injunction Suit to Prevent Their Use—Aim to Secure Unadulterated Coal Tar Distillate.

During the past few years there has been much discussion of the question of the proper specification for oil for treating blocks for creosoted wood block pavements, and the technical societies have been slow to adopt specifications because of the strenuous efforts that have been made on the one hand to restrict the oils to be used to those made of mixtures of creosote oils and crude coal tar, and on the other hand to prevent such restriction on the grounds (1) that good oils, even better oils for the purpose, would be rejected and (2) that the use of coal tar mixtures would be detrimental to the cause of wood block pavements. The only society which has adopted standard specifications is the American Society of Municipal Improvements, which, as the result of several years' discussion, has recently adopted three specifications for the oil for treating blocks, choice of which may be made by the city using them. One oil is called coal-tar paving oil, one is called coal-tar-distillate oil, and one is refined water-gas tar. These specifications have been subjected to criticism as to some of their details and may be modified as the knowledge of the state of the art advances.

Some technical information of great value in the consideration of this problem is contained in the evidence presented on both sides of a recent injunction suit on trial for four days in Chicago, brought to prevent the use of the so-called Chicago specification for creosote oil for treating wood paving blocks. The specification was sustained mainly on purely legal propositions, but the evidence is none the less interesting.

It was admitted in the case that the city had experienced much trouble with bleeding of blocks treated with coal-tar paving oils and was considering the abandonment of wood block paving as a consequence, but the satisfactory nature of two streets laid with blocks treated with a coal-tar-distillate oil led to the adoption in 1912 of a specification which has become widely known as the Chicago specification. In the case in court it was shown that some modfiications had been made in details of this specification to prevent as far as possible the adulteration of the coal-tar-distillate oil with crude coal tar or distillates of petroleum, these modifications having been made in 1914 and 1915.

The Chicago specification was the first detailed attempt to secure for street paving purposes an oil which would fulfill the three most essential demands made of a material for treating wood blocks for paving, assuming, as practically all authorities do, that an oil meeting these demands will necessarily possess enough preservative qualities to prevent decay of the wood:

(1) An oil high enough in boiling point so that it will not evaporate materially at any temperature of the street;

(2) A waterproof oil, insoluble in water;

(3) An oil liquid enough at temperatures used in the commercial treatment of blocks to diffuse throughout the blocks, and containing no impurities that will prevent or delay such diffusion.

The Chicago specification proposes to meet the first of these requirements by providing that not more than 22 per cent of the oil shall distil below 235 deg. C., and not more than 40 per cent below 315 deg. C. This results, in a coal-tar-distillate oil, in a specific gravity of 1.10 to 1.14, which is an accompanying requirement of the specifications. It was shown that, with the distillation requirement above, the 1.08 minimum specific gravity of the original Chicago specification was of no significance, as a coal-tar-distillate oil of 1.08 specific gravity probably could not meet the distillation tests given above. These heavier oils practically meet the above named second demand made of a perfect paving oil.

The third demand of the perfect oil named above, fluidity and diffusibility at temperatures of treatment of blocks, is met by the coal-tar-distillate oils passing the Chicago specification. Crude coal tar of good quality has a higher specific gravity and is soluble in the lighter creosote oils, so that a mixture of them can be brought within the requirements of specific gravity in the specifications, but the distillation tests and the requirement that the residue after distillation to 355 deg. C. shall be waxy and not brittle and when placed on white filter paper and warmed the oil spot shall show a clear amber color, detects the mixture by the high percentage of low boiling oils or the dark or black spot made by tar in the spot test, or both.

It was discovered that a coal-tar-distillate oil meeting the original Chicago specifications could be adulterated with residues from distillation of petroleum, and for the pavement in court the specifications were modified in 1914 or 1915 in certain details of tests to prevent such adulteration. These tests did not change the general character of the original Chicago specifications, but merely made them more definite on this point, and because of them not enough petroleum residue can be used as adulterant to prevent the oil meeting the third demand, ability to diffuse through the block and absence of impurities preventing such diffusion. The two tests added were as follows:

(1) When distilled under certain specified conditions, that part of the oil which distils between 250 and 315 deg. C. must contain not less than 5 per cent of tar acids;

(2) The amount of unsaponifiable oil in the same fraction must not exceed 1½ per cent thereof.

These two tests together serve to reduce the possible adulteration with petroleum products to a minimum or prevent it altogether.

Test (1) has an additional use of great value just now, when the tar acids are being removed from coal tars for use in munitions manufacture. These tar acids are removed from the lower boiling fractions, and the total amount in the higher boiling fraction of the test is so small that it is not worth while to remove it commercially even in these strenuous times. These high boiling tar acids are among the most important toxic elements in the creosote oils, being much stronger than those in the lower boiling fractions. The specification therefore does not interfere with winning the war and at the same time it insures the supply of the very small amount of toxic ingredient necessary to make the oil a good preservative of the wood.

It was shown by the testimony that certain large supplies of coke-oven tar did not contain the necessary proportion of tar acids to meet the added test (1), but it was also shown that coal-gas tars were obtainable in sufficient amount in the open market to produce many times the amount of creosote oil necessary to meet test (1), either used alone or in mixture with tars of low tar-acid content to bring them up to the specification and test. The claim in the complaint that this test (1) produced a monopoly was therefore not allowed by the court in the decision of the case.

One claim presented in the case was that the tar-acid test and the oil as a whole could not be met and produced without infringing a patent issued to P. C. Reilly in March, 1917, although the original specification was adopted in 1912 and the modification, including the tar-acid test, was added a couple of years later. It was shown that the patent referred to covers products produced by distillation of coal tar at temperatures above 700 deg. F. (391 deg. C.) and could not in any event cover tar-acids in a fraction distilled below 700 deg. F. It was also shown that oil meeting the Chicago Specifications could be produced readily from the products distilling below 700 deg. F., so that the oil could be made without entering the field of temperatures mentioned in the patent.

The Chicago city officials are defending their specifications because they were made as a result of great troubles with pavements constructed under a specification permitting the use of tar mixtures, and have removed those troubles. Wood block paving is now popular in Chicago, as contrasted with the demand for its abandonment in 1912 in the midst of the troubles with tar mixtures.

ESTIMATING SEWAGE FLOW FROM FLOOR AREA.*

Used in Districts Where Day or Temporary Occupants of Buildings Exceed Residents—Methods of Measuring Sewage Flow.

The usual method of estimating sewage flow on the basis of resident population is unreliable and misleading for a municipal district like that of lower Manhattan, with its tremendous daily influx of transients in the office buildings, hotels, department stores and manufacturing buildings. In certain wards the resident population is steadily decreasing, although the number of individuals in the ward during business hours probably is not. In fact, the areas where most losses in resident population occur, owing to business buildings replacing residences, are the areas in which the amount of transient population is the greatest. This transient population, especially that in hotels, contributes a material amount to the sewage of the district.

This population is dependent upon the area of floor surface occupied; that is, in the case of a building that extends full size to the roof, upon the ground space occupied by the building times the number of floors in the building. Some statistics taken by the Sewer Bureau in department stores and hotels show actual densities of daily working population in department stores varying from 865 to 2,670 per acre (including street surface), this varying with the season of the year; while in hotels the density varied from 770 to 2,630 per acre. These figures do not include the number of people shopping in department stores or those in the hotels who are not either guests or employees.

William W. Brush, in making estimates for the Catskill water supply, made an investigation from which he decided that "other things being equal, the amount of water used in any building would be dependent upon the ground area covered and the number of stories in height." He decided that the amount of water used in any building is proportional to the size and height of the same. The total floor area can readily be obtained from available atlases of the city. Meter readings of hotels and business buildings taken in 1916 show the average consumption of six of the best hotels to be 526 gallons per thousand square feet of floor area, varying from 368 to 694. Five tenement and apartment houses gave an average of

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*Abstract of paper before the Municipal Engineers of the City of New York by Walter S. McGrane, assistant engineer of the Bureau of Sewers, Manhattan Borough.

230 gallons per thousand square feet, varying from 138 to 295; and five office and manufacturing buildings gave an average of 250, varying from 194 to 271. Each class of buildings gave a peak load about 25 per cent higher than the average.

In most cities, anything like accurate forecasting of consumption would be complicated by the difficulty of estimating the number of floors to which the buildings in the several districts would be carried; but New York now has zoning laws which limit the heights of buildings in the different zones, and it can be assumed as a maximum that all of the buildings in a zone will reach the maximum permissible height. In the calculation for Manhattan, the total area is reduced by 33 per cent to allow for streets, and this net area is further reduced by 15 to 30 per cent for court areas required by law. The building area thus obtained is then multiplied by the average number of floors, giving the total floor area; and this area, expressed in units of 1,000 sq. ft., is then multiplied by the constant gallons-per-day factor for the class of buildings which is expected to occupy the district in question. For convenience in sewer calculation, this is reduced to cubic feet per second per acre of total area.

Gaugings of sewage flow from typical areas were made from time to time in different parts of the city to assist in determining the factors to use in calculations of this kind. In making these sewer gaugings, various appliances were used, including floats, pitot tubes, current meter and one or two others. Mr. McGrane, who had charge of the work, decided that the float method, properly checked by pitot readings, was probably the most practical for gauging sewage flow under conditions found in Manhattan Borough. Difficulty was experienced in carrying on the work because of the presence in some sewers of great quantities of gasoline vapors, illuminating gas and steam; also, occasionally, great depth of mud near the outlets, obstructions from pipes, back-water from tides, excessive velocities, poor light, and last but not least, the influence of large house connections.

Having decided upon the point for making a gauging, the sewer was cleaned for a distance 100 feet each way from the section by the cleaning gang of the department. The distance between the centers of two manholes was accurately measured, an extension-leg level and short rod were used for running a line of levels on the sewer invert with readings at 10-foot intervals, and the cross section of the sewer at a point near each of the two manholes was measured. The party usually consisted of five men when engaged in putting floats through and six men when taking pitot readings. In the former case, one man remained on top at the up-stream manhole and two men at the bottom of this manhole, one to start the floats and the other to keep the time. At the down-stream manhole there was one man on top guarding the hole and one on the bottom to receive the floats and call out the time. While sending the floats through, the height of the sewage is taken at regular intervals, being measured down from a plank set horizontal and whose elevation is taken accurately. The surface floats used at first consisted of wooden strips 4 inches by 8 inches by ½ inch, but it was finally decided that better results were obtained by using a float to the bottom of which were nailed two tin vanes at right angles to each other and extending 3 or 4 inches at right angles to the board; the object of the vanes being to catch the maximum velocity, which was about one-fourth of the depth below the surface.

The mean velocity used in calculating volumes of flow was obtained by multiplying the float velocity by a coefficient varying from 0.75 to 0.80. To check the coefficients, a pitot tube was used, consisting of a glass tube two feet long and ½-inch in diameter, bent 45° at one end and tapered off as a cone which terminates in a small cylinder about 1/32 of an inch in diameter. The tube is set so that the lower end is horizontal and the main part of the tube makes an angle of 45° with the vertical. This position serves the purpose of exaggerating the velocity head to facilitate the accurate measurement. The combined virtues of the nozzle and standard short tube are found in the shape of the cone and tip, giving a very high coefficient of 0.98. In spite of the fact that the tip was continually clogging when immersed in the flow, this appliance gave very good results. In using the pitot tube, a frame was employed to which the tube was fastened, this frame being so constructed that it could be slid along a horizontal board set in the sewer, and the tube slid up or down along the 45° bed of the frame so that the pitot end could be brought to any part of the cross-section. The cross-section was then divided into a number of small imaginary sections of equal area and a reading taken at the center of each section. The difference between the static elevation and velocity head was measured directly from the tube.

In rating the floats, these were put through the sewer at the same time the pitot readings were being taken and for as short a distance above and below the pitot station as it was practicable to use and obtained precise velocity readings.

One of the greatest sources of error encountered in measuring sewage flow arose from the influence of house connections, especially the larger sizes. If the house connection entered above the surface of the sewage, or if the sewer section was narrow or the velocity flow more than 3 feet per second, the effect was not so marked. But when the house connections were near the flow line, the sewer section wide, and the velocity below 3 feet per second, the effect on float velocities might be considerable. In making a velocity determination, five floats were put thorough, one after the other. From a considerable number of observations it was decided that if the five floats did not vary more than 2 per cent or 3 per cent, probably no house connections were operating and the arithmetical mean was used. If one float varied 3 per cent to 6 per cent from the mean of the other four, the length of route covered by the float was assumed to be greater than the straight length of sewer by eight-thirds of the extreme variation caused by the float swinging first as far as possible to one side and then the same distance to the other side of the center line of the sewer. If the tardy float was 6 per cent to 10 per cent behind the others, sixteen-thirds of the extreme variation was added. If the tardy float was more than 10 per cent behind the others, it was discarded as an observation.

In one case a standard sharp-edge weir with a stilling-box arrangement was used and gave very accurate results; but it was concluded that placing weirs in sewers is seldom practicable, since the weir must be made water-tight and yet so constructed that it can be removed readily in case of storms in order to prevent the flooding of cellars; and it was found almost impossible to satisfy both conditions. In addition to this, the presence of the weir causes the precipitation of great quantities of solid matter behind it which tends to back up the sewage into the house connections. Attempts made to measure the sewage flow by means of a current meter were unsatisfactory, owing to the fact that suspended matter clogged the mechanism.

At the time of writing this paper, a few weeks ago, the author was experimenting with what is known as the Sanborn automatic gauge, utilizing pneumatic pressure, which had up to that time given better results than others which had been tested, although it required more or less constant attention.

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SALARIES FOR CITY MANAGERS.

We have received from H. G. Otis, the secretary-treasurer of the City Managers' Association, a list of the cities operating under this plan, giving the population of each city and salary paid, together with other information, as shown by a table published elsewhere in this issue. In this list there are classed as city managers "any person who is the administrative head of a municipality appointed by its legislative body"; this being the definition given in the by-laws of the association.

The salaries are seen to range from $900 a year for the smallest city (with a population of 500), to $10,000 a year, paid by two of the larger cities. In a general way, the salaries paid vary with the population. The writer has plotted these, using each population as an abscissa and the corresponding salary as the ordinate, in an effort to find an approximate relation between the two. In this way he obtained the formula:

$$\text{Salary}=\sqrt{1{,}000{,}000+500\ (\text{population})}.$$

This represents with fair accuracy the average of all the salaries. There are, of course, a few which vary considerably from this, some small cities paying large salaries (Santa Barbara, Cal., with 18,000 population, pays $7,500), and most of the salaries vary slightly from this average curve. But a more consistent relation between population and salary was found than had really been expected before beginning the analysis.

By use of this formula a city can answer the question, "What is the average salary paid to city managers by cities of our size?" Should the city feel that it desires to obtain a little better than the average qualifications in its manager, or that salaries generally are higher there than in other sections of the country, it could then add somewhat to this average; or, on the other hand, it could offer a salary lower than this if other reasons seem to indicate the desirability therefor.

In general, it is encouraging to note that the salaries run fairly high, indicating that the importance of the position is realized by the majority of cities.

GAMBLING BIDS.

We were under the impression that the evils of the unbalanced bid were so generally known and appreciated, even by the public at large, that the acceptance of such a bid in its most flagrant form was practically unknown at the present day.

The above is the opening sentence of an editorial that appeared in Municipal Journal nine years ago, called forth by the fact that Chicago had let a contract under which resurfacing was to be done at $1.75 a square yard and reconstruction at one cent a square yard. Based on the estimated quantities of the two items, this was the lowest bid; but the amounts of the two that were actually performed were such that the total cost to the city was $96,500 greater than if the next lowest bid had been accepted. This was the most flagrant case of unbalanced bidding that had come to our notice.

Another instance of a very similar unbalanced bid has recently occurred in Boston. The contract has not yet been awarded, we understand, and it is certainly to be hoped, for the credit of the city, that the unbalanced bid will not be accepted. In this case the low bidder (on the basis of the estimated quantities) offered to do one-inch resurfacing (with a surface heater, we believe) for one cent a square yard, while the average bid of the three other bidders for this item was 60 cents. If the other bids were based on a 20 per cent profit, this firm stands to lose 49c for every square yard of resurfacing it lays.

On the other principal item (relaying with 1½-inch binder and 1½-inch asphalt surface) the low bidder's offer was $1.55 and the next bidder's was $1.38. If no resurfacing be done, the cost will exceed that of the next bidder by $5,600. If the city should elect to do all of the work as resurfacing, the contractor loses $17,150. It looks like a three-to-one gamble on the part of the contractor that the city will not do any resurfacing. This firm comprises men that are not new to the business and it is not to be supposed that they are running any unnecessary risks. In fact, if such a thing were possible, we would be inclined to think that they *knew* that very little of the resurfacing would be done. At least they must be very sure of it.

It lies with certain city officials to decide how much of each item of this contract will be done. If they decide one way, the city will lose; if the other way, the contractor will lose. The Supreme Court of West Virginia decided recently that: "If the performance of the obligation of a contract furnishes temptation to use improper influence with a public official, the contract is illegal, and no right or obligation can be founded upon it." We can hardly conceive of any contract that would furnish greater "temptation to use improper influence with a public official" than this one does. It would seem that the contractor's only chance to win is to use such influence.

If the bid is a gamble between the contractor and the city, then we say the city officials have no right to gamble with the taxpayers' money. Experience should have convinced both taxpayers and officials that a city that sits in at such a game is almost invariably a loser—Chicago was a typical example.

If it is not a gamble, what is it? It certainly is not a plain business proposition. The most favorable construction that can be put upon it is that it furnishes the foundation for a continuous scrap between contractor and officials as to how much of the one-cent work shall be done, with the moral certainty that such of it as is done will be done as cheaply and poorly as the contractor can do it.

If it is a gamble, the taxpayer loses; public business is not organized for efficiency in gambling.

If the contractor, by persuasion or other means, secures the elimination of the one-cent work, the taxpayer loses because of the higher price for the other class of work.

If a large amount of one-cent work is done, both contractor and taxpayers lose; the latter because the work done will almost certainly be worthless, for not in one case out of a thousand has it proved possible for an engineer, with the best of intentions, to secure adherence to the specifications by a contractor who is doing work at an enormous loss.

That others hold the same view is evidenced by the following resolutions passed last week by the Massachusetts Highway Association:

> Resolved, That in the opinion of this association, when in competitive bids any item is offered at manifestly less than its actual cost, such bid should be rejected as "unbalanced," unfair and against the interest of the municipality.
>
> Resolved, That in the opinion of this association, when the same person or persons are interested in two or more bids made in different names, in competition for the same work, all of such bids should be rejected as collusive and against the interests of the municipality.

The second resolution referred to a claim that a certain individual or individuals were largely interested both in the firm presenting the unbalanced bid and in one of the others bidding on the work. We need hardly say that we endorse the opinion expressed in this second resolution. Unless collusion between bidders is prevented, the bidding ceases to be competitive and leaves the way open for exorbitant charges.

Both unbalanced bids and collusion between bidders in connection with any public letting should cause all bids involved therein to be considered informal if not illegal; and the laws governing the awarding of bids by every city, county, state and other political unit should make compulsory the throwing out of every unbalanced bid and all bids in the making of which it can be shown that there was collusion.

DITCHING WITH DYNAMITE IN WET SOIL.

Not long ago it was found necessary to do considerable drainage ditching in a southern state in government work, more or less directly connected with war activities, but which we are requested not to specify more definitely. The information given below was furnished by one of the government engineers on the work.

The work referred to was greatly retarded by the fact that it has been very difficult to obtain laborers and still more so to keep them, as the work of ditching is disagreeable and labor usually deserts for more congenial work at the first opportunity; the average term of employment on the work being usually not more than one week.

This being the case, it was decided to try the use of dynamite as a substitute for hand ditching. A professional demonstrator was furnished by the Du Pont company. The first test was made on a creek straightening proposition. The channel planned was 10 feet wide on top and 4 feet deep, with banks about 1 on 1. The soil was a clayey muck filled with water.

Du Pont 60 per cent straight dynamite was used on the first trial. A double row of holes, rows 24 to 30 inches apart, with holes 24 inches apart, was loaded with two sticks of 60 per cent per hole and fired with one electric cap in the center holes, the other holes detonating by propagation. The result was more than satisfactory and indicated that more than the necessary amount of dynamite had been used. A hole 10 to 12 feet wide was cut clean and sharp, the depth being about 4 feet. The loading called for one pound of dynamite per running foot of ditch.

Another test was made with a single row of holes spaced 18 inches apart. It so happened that the section selected for this test was interlaced throughout with roots from stumps and trees, so that the result was not wholly satisfactory and another smaller charge was necessary to wholly remove the stumps and trim and straighten the edges. In clear ground (not interlaced with roots) this charge would probably be sufficient.

A third test was made on a stream fairly straight, but filled with stumps. The stream was about 8 feet wide and 18 inches deep, with 24 to 48 inches of very soft muck in the bottom. It was desired to remove the stumps and clear out the soft muck to a depth of about 36 inches.

Only 40 per cent straight du Pont dynamite was available for this work and this necessitated putting a cap in every hole, as this dynamite is not sufficiently sensitive to detonate from the explosion of other sticks in holes 18 inches to 2 feet away.

Both one and two-row loading were tried in this work. Best results were obtained with the latter method, but the softness of the material prevented the banks from holding their shape, so that the use of dynamite on such work is of doubtful utility for merely trenching work, though for stump removal it is valuable. However, the use of higher grade powder and heavier loads might produce better results.

For water-filled soils that are not too liquid, especially where trees, roots and stumps render hand work costly and slow, it is evident that the proper use of dynamite will result in a large reduction in ditching costs. For this use, 50 per cent straight or 60 per cent straight dynamite is most suitable, as it can be fired by detonation or propagation from one cap in a central hole, thus obviating the necessity of using an electrical firing machine and placing a cap in each hole. With the dynamite above specified, a fuse and cap can be used in one hole.

The cost will be considerably less in practically every case, as even in comparatively large ditches—10 to 12 feet wide on top and 3 or 4 feet deep—not more than a pound to the running foot will be needed, including the extra amount necessary for removing medium-sized stumps. Perhaps it has a greater value, however, in allowing rapid completion of work, irrespective of the labor situation.

REGULATING HIGHWAY WORK.

The state highway commission of Wisconsin has sent instructions to all county boards that decision as to what improvements they are to carry on this season must be made by the division engineers of the commission, who will meet with the county committees to discuss the matter. The object, of course, is to utilize to the greatest advantage of the state and nation at large—and at war—such money, materials and labor as are available.

HOGS AND HEALTH.

The secretary of the state board of health of North Carolina, having been asked his opinion as to the raising of hogs in populous districts, has advised strongly against it. Raising hogs on farms established some distance from the town limits is approved, but he is "not aware of the advocacy or the sanctioning of hog pens in towns or cities by health officers of any reputation whatsoever." Even under these war conditions as to food, he submits that the health of the citizens is of more importance than abundance of pork. He gives no intimation of his reasons for considering pig pens inimical to the health of neighboring residents.

The WEEK'S NEWS

Government May Maintain Military Roads—State Highway Events in Oregon and Indiana—U. S. Attacks Problem of Malnutrition—Attempt to Abolish New York Cities' Health Boards—Cleveland Opens New Filtration Plant—Regulation of Fuel Oil Sales by U. S.—Street Lighting Contract in Buffalo—Difficult Fires in Johnstown, Shamokin, Pa., New York, Jersey City, Newark and Trenton—Consolidation of State Boards in Oregon—Syracuse Garbage Plant Explodes.

ROADS AND PAVEMENTS

Proposes Federal Maintenance of Military Roads.

Washington, D. C.—If the bill introduced into the United States Senate becomes a law, the main highways of the country, including the Lincoln Highway, will be converted into military roads under government control and with the government paying part of the repair cost. The bill was introduced because of the growing realization on the part of the War Department and Congress of the destructive effect of the heavy government trucks, which in increasingly greater numbers are making use of the Lincoln Highway and other main roads in the east in the transportation of government supplies to Atlantic ports. The magnificent macadam highways of Pennsylvania were not built to take care of the type of traffic now continually flowing over them and the Lincoln Highway is suffering rapid destruction not only from the government trucks themselves, but from the commercial trucks running in increasing numbers and in accordance with the government's desire, relieving the railroads of a burden of many thousands of tons of freight. The bill which was introduced by senator J. W. Smith of Maryland provides that because of the deterioration and possible destruction of many permanently improved highways, unless unusually large expenditures are made for their maintenance and repair, due to the government army trucks, the Secretary of War after an investigation of the facts shall on petition of a state highway commission, declare such roads as military roads, and the government shall then contribute in suitable installments its portion of the funds necessary to maintain these highways in good condition. This money which will be available should the bill become an act will be in addition to the Federal Aid provided by the Bankhead-Shackleford Act.

Oregon Spends More Than a Million on Roads.

Salem, Ore.—The state highway commission has announced that from December 1, 1916, to March 1, 1918, the commission expended $1,049,250.30. Of this amount $65,391.59 was for administration, $83,942.78 for equipment and $899,916.13 for construction, maintenance and surveys. Under the head of administration is embraced the following charges: Commission, $2,686.61; auditing, $6,356.74; highway department, $22,708; bridge department, $33,639.24. The amount disbursed for construction was approximately $768,000 and for surveys $130,000. The principal expenditures were as follows: Columbia river highway, $326,900; Pacific highway, $121,786; John Day highway, $37,600; Oregon-Washington highway (Umatilla county), $159,467; Rex Tigard, $98,714; The Dalles-California highway, $19,787; McMinnville-Tillamook highway, $27,204.

State Argues for Validity of Highway Law.

Indianapolis, Ind.—Attorney-general Stansbury has been in Noblesville, where he made an argument in support of the constitutionality of the state highway law enacted by the 1917 legislature. The law is attacked in a complaint filed some time ago by Robert M. House, a taxpayer. The state filed a demurrer, and the argument was on the demurrer. The litigation over the highway law is said to be one of the most important in the state pending at this time because of the large amount of money and large number of proposed improvements involved. About 800 miles of road have been projected under the law at a cost of many millions. The law was enacted so that Indiana could comply with the conditions under which federal aid would be granted under the law enacted by congress in 1916. The state act provides a levy, creates taxing districts and creates a state highway commission. The state highway commission is authorized to designate "main market highways." The cost of improvement is to be divided, one-half to be paid by the county or district, one-fourth by the state and one-fourth by the federal government. To get federal money for a road at least 70 per cent. of the road must be used by the rural postal service. Should the state law be overthrown the state would be deprived of federal aid, at any rate for the present. The complaint denies the power of the legislature to levy a tax and create taxing districts in the way followed in the statute.

SEWERAGE AND SANITATION

U. S. to Cooperate with Cities on Malnutrition.

Washington, D. C.—Secretary McAdoo announces that as a result of studies by the United States Public Health Service of the causes for rejections for physical defects under the selective draft law, it has been established that malnutrition during childhood is one of the avoidable troubles. The service is now considering a national program of cooperation with state, county and municipal health authorities for the purpose of safeguarding the health of school children. The public health service has been engaged for some years now in collecting valuable data as to the state of nutrition and mental and physical health of school children. An official statement says: "In view of the increasing economic stress occasioned by the war at least one valuable means for enabling the rising generaton to pass unscathed through this period consists in taking steps to see that school children are provided at midday with a warm, properly balanced meal. The value of the school luncheon consisting of properly balance articles of diet furnished to school children either at cost or somewhat below cost, has long been recognized as a valuable means for promoting healthy growth and development. The rising cost of living and lack of general knowledge of healthful substitutes for valuable articles of food, which are steadily becoming scarcer, emphasizes at this time the necessity for making provision by health authorities of hot, nutritious meals for school children during the noon hour."

Cities Stop Plan to Abolish Health Boards.

Albany, N. Y.—An attempt to put through the legislature a law which would abolish city health departments has been discovered, and through the efforts of the cities of the state, led by Buffalo, Rochester, Syracuse and Schenectady and the mayors' conference, the danger has been warded off. Hearings were postponed and the bill then withdrawn when the cities protested that their health progress would be put back by such a violation of home rule principles. In effect, the Whitney bill would eliminate all existing boards of health and health officers and centralize all authority in the state health commissioner, to be exercised through appointive county boards of managers responsible only to the commissioner. The city health bureaus, the present management of the tuberculosis sanatoria, laboratories, etc., would go. The boards of supervisors would be given power to establish each county as a separate health district, to appoint a county board of health of seven unpaid members for terms of six years and delegate to the board all powers and duties of present health boards and health officers. One member of the board must be a lawyer, one a physician and one a graduate civil engineer. "Upon the appointment of a county board of health," says the bill, "all local boards within the county and the offices of local health officers shall cease and the new board shall determine upon the appointment of a county health officer, appointed by the county board and not a member of it. He shall be paid not less than $3,000 a year, shall hold office during good behavior and shall have all the powers of local health officers. The county health officer may divide the county into sanitary districts, alter them at will, appoint deputies and fix their salaries and appoint sanitary inspectors, public health nurses and similar assistants." In addition, "the board of supervisors may determine that there shall be a public hospital with separate wards or buildings for the care of tuberculosis, contagious and social diseases, and dispensaries for three separate purposes. It may name a board of managers of five, for terms of five years, to build and conduct such a hospital, which takes the place of any tuberculosis hospital in existence."

Officials Arrested for Stream Pollution by City.

Hillsboro, Tex.—The mayor and aldermen were recently arrested, under grand jury indictments charging pollution of streams under an act passed by the Legislature in 1913 governing the emptying of sewage into any river or its tributary. This is said to be the first criminal prosecution in the state under the law, which allowed cities three years in which to comply with the requirements of the law. Hillsboro has already taken the first steps to remedy the defects in its sewage disposal plant through an election increasing the bonding limit of the city. An election for bonds is contemplated.

Another City Joins Passaic Valley Sewer.

East Orange, N. J.—Deciding to make a deal with Newark to pay $825,000 now and $150,000 twenty years after the Passaic Valley trunk sewer is in operation, meanwhile contributing an estimated $11,000 a year for maintenance, East Orange has solved its long-standing sewerage problem. It will be permitted to use the big flume at a cost approximately $100,000 higher than it might have done two years ago, when mayor Worrall F. Mountain obtained an order from Newark for an initial price of $725,000. One-half of the $825,000 is to be paid within ninety days of the making of the deal and the remainder when the trunk sewer is in operation. The $150,000 is the estimated share of East Orange in the high level sewer which will be necessary to meet future needs in the Roseville section, and which could have been accommodated without extra expense if East Orange were not taken into the trunk sewer. About five years ago a special sewer committee reported that it would have cost East Orange $1,016,000 to share in the trunk sewer on the terms offered in the apportionment of cost on the basis of tax ratables. Independent sewage disposal by means of the Imhoff tank, which East Orange has been striving for during the past ten years, was put at an initial cost of about $600,000, but objections that the proposed plant for that purpose in the Soho section would be a nuisance, as well as the uncertainty of the method's success, deterred East Orange from making a deal jointly with Montclair and Glen Ridge. The agreement, as contemplated, provides that the city shall dispose of East Orange sewage up to 10,000,000 gallons a day for the twenty-year period and 14,000,000 gallons after that. This city now is under contract to take up to 4,000,000 gallons daily, a figure which is frequently exceeded, according to claims that have been made by the local officials. The existing arrangement, which was made twenty-four years ago, permits East Orange to deliver its sewage at the municipal line to a main specially constructed from that point to the Passaic river. The prospective agreement was to a great extent helped, it is stated, by the fact that the privilege given East Orange in perpetuity, before the intercepting sewer was thought of, constituted a valuable asset.

WATER SUPPLY

To Use Day Labor on Hetch-Hetchy Work.

San Francisco, Cal.—The board of supervisors has appropriated $250,000 for work on Hetch-Hetchy other than by formal contract. City engineer M. M. O'Shaughnessy stated that this sum is for work to be done by day labor where bids are considered to be too high. The board of works has found an ordinance under authority of which it is possible to make purchases without contracts. Questioning the city engineer for his authority for going ahead with work by day labor without contracts and asking president Reardon of the board of public works by what right a locomotive had been bought in the open market for $24,100, chairman Wolfe was informed that an ordinance passed by the board of supervisors provides that after bids on Hetch-Hetchy materials and equipment have been duly received and rejected for proper reasons the board of public works may buy in the open market. O'Shaughnessy said he asked for the $250,000 in order that work might go on. He explained that $9,000,000 was the lowest bid for tunnel work which he had estimated at $6,000,000, and that by doing the work by day labor the cost had been kept within the original estimate. He added that the lowest bid for 2,000 poles needed had been $6 a pole, but that cut by day's work the poles had cost $2 apiece.

Water Plants Pay for Excess Diversion.

Trenton, N. J.—Nine municipalities, eleven water companies and two manufacturing concerns will be required to pay amounts aggregating $19,766.66 this year for excess water diverted under the provisions of the act passed in 1907. The act imposes a charge of $1 per million gallons for all water in excess of that authorized in the act. The excess diversion for the past year, amounting to nearly 20,000,000,000 gallons, has been fixed by the State Department on Conservation and Development and certified to the state controller.

Mayor a Strikebreaker in Waterworks Strike.

Great Falls, Mont.—Four men, all of them city officials, furnished the service at the city water filtration plant as the result of a strike by the engineers at the plant. Mayor Fousek and superintendent M. L. Morris worked on the night shift and city engineer L. B. Evensen and assistant city engineer A. E. Coonrod attended to the day shift.

Cleveland's New Filtration Plant in Operation.

Cleveland, O.—About half the city, for the first time in its history, is now being served with filtered water, a large part of the new West Side filtration plant, which has cost $3,500,000, having been put into operation. Fifty million gallons a day are being served. This will give filtered water to the entire districts known as the west side low service and east side and west side first high service. This territory includes the whole west side and the entire southeast side of the city. It also embraces the city of Lakewood, part of East Cleveland, and the villages of Brooklyn Heights, Cleveland Heights, Rockport, part of South Newburg and Newburg Heights. Public utilities director Farrell and water commissioner Martin, in announcing the beginning of operations of the filter plant on a large scale, anticipated that by April 15 every consumer supplied by the city would be given filtered water. The filtration plant began to operate experimentally early last November, since which time a daily output of 8,000,000 gallons of filtered water has been maintained. Because this was only a small part of the entire quantity consumed daily, it was mixed in the mains with the "raw water." Director Farrell said the 50,000,000-gallon a day rate of filtration will be increased gradually. Within a month, he said, he expects the output to be doubled, allowing practically city-wide distribution. "The total capacity of the plant, as estimated by engineers concerned in its erection, is declared to be 150,000,000 gallons a day, with an extreme limit of 160,000,000 gallons," the director said. "We consider it inadvisable, however, to greatly tax the plant, because of defects found in the construction, until we have assured ourselves by actual test whether repairs have completely overcome the building faults." Water department officials estimated that the maximum daily consumption of water in all communities supplied by the city will not exceed 135,000,000 gallons in midsummer—the "peak season" for water use. They said of this capacity cannot be reached when the filtration plant is put in full operation, a small percentage of "raw water" may have to be mixed into the mains supplying a small isolated district.

The original cost of the filtration plant, erection of which was started under a previous administration, was estimated at $2,500,000. "Serious defects in the construction soon appeared, however. So far, approximately $700,000 additional has been expended to remedy these conditions and $300,000 more probably will be required to complete the repairs. The original defect discovered was in what is known as the clear water basin or reservoir out of which the filtered water is pumped. Gross faulty workmanship and poor material, it was found, had entered into the construction of this part of the plant, which, unless corrected, would have rendered its operation impossible. Subsequently, it was found that in the filter plant proper the building containing the coagulating basin was gradually slipping towards the lake, because the foundation had been built without proper piling on ground immediately above large deposits of peat and other boggy substances which gave way under the pressure of the building. By driving a large number of piles, our engineers believe the effect of this defect has been overcome."

STREET LIGHTING AND POWER

Priority in Fuel Oil Sales.

Washington, D. C.—Revised regulations for the distribution of fuel oil in the United States east of the Rocky Mountains have been issued by the Fuel Administrator with the authorization of President Wilson. Under a proclamation of the President, dated Jan. 31, all manufacturers and distributors of fuel oil, including gas oil, whose gross sales aggregate 100,000 barrels a year, were required to obtain a license by Feb. 11. The rules governing these licenses have now been revised because it has been found that distributors controlling only small supplies of fuel oil were frequently unable to meet the requirements of all of their customers. The situation worked a hardship to the customers of the small distributors and deprived essential industries of oil. Under the new regulations if a distributor is unable to meet the requirements of all his preferred customers another distributor may be required by the Fuel Administration to meet this demand before he is allowed to supply his own customers who are not on the preferred list. Twelve classes are put on the preferred list, and manufacturers and distributors are required to give priority in the distribution of fuel oil to them in the order in which they are named. They are:

1. Railroads, bunker fuel and oil refineries using or making fuel oil.
2. Export deliveries or shipments for the United States Army or Navy.
3. Export shipments for the navies and other war purposes of the Allies.
4. Hospitals in which oil is now being used as fuel.
5. Public utilities and domestic consumers now using fuel oil (including gas oil).
6. Shipyards engaged in Government work.
7. Navy yards.
8. Arsenals.
9. Plants engaged in the manufacture, production and storage of food products.
10. Army and navy cantonments where oil is now used as fuel.
11. Industrial consumers engaged in the manufacture of munitions and other articles under Government orders.
12. All other classes.

Deliveries must be made in conformity with this list regardless of existing contracts between licensees and consumers in other classes. After the requirements of consumers entitled to priority are satisfied, licensees must carry out their contracts for other deliveries to the extent of their supplies.

In promulgating the new regulations for the distribution of fuel oil President Wilson made this statement concerning the need of conservation: "The rules and regulations are promulgated by the President acting through the United States Fuel Administration for the purpose of assuring an adequate supply and equitable distribution of fuel oil for the purposes vitally essential to the national security and defense and to the successful prosecution of the war. The shortage in the amount of fuel oil which can be delivered because of transportation conditions is such that it is clearly a wasteful and unreasonable practice to deliver such fuel oil for purposes which are not intimately and directly connected with the prosecution of the war."

Municipal Ownership Disapproved.

Ladysmith, Wis.—The voters have defeated the proposition that the city assume ownership of the local light plant. The vote was 257 against 157 in favor.

New Contract for Street Lighting.

Buffalo, N. Y.—The city council has directed the commissioner of public works to contract with the Welsbach Street Lighting Company of America "for furnishing and equipping 2,000 or more street lamp posts with 60.150 candlepower incandescent mantle gas lamp heads complete of boulevard or ornamental type with either upright or inverted mantles where gas mains now exist or may hereafter be laid, for furnishing all other material, labor and equipment (except posts, gas service, and riser pipes and gas) for lighting, extinguishing, cleaning and keeping in repair such lamps for a period of five years from March, 1918, to March, 1923, also for furnishing street lamp posts equipped with 40 candle power incandescent mantle naphtha or hydro-carbon lamp heads of the boulevard type and all labor and material necessary for the installation and maintenance of same and for lighting, extinguishing, cleaning and repairing all such lamps." The rules are as follows:

For present number of gas lamps approximately 9,500, and as many more as may be required and ordered.

For the boulevard type 60 candle power lamps at 3 9-16 cents per lamp per night or the ornamental type 150 candle power lamps at 4⅝ cents per lamp per night.

Should the number required be between 7,500 and 9,500, these rates are increased respectively by 1-16 cent. and similar increases are provided should the number be between 5,000 and 7,500 and further increases if the lamps number 2,000 to 5,000.

For the present type of naphtha boulevard lamps 15½ cents per lamp per night.

With a reduction in the price of naphtha lamps at the rate of $1.01 per lamp per year for each one cent reduction in the average monthly cost to said company per gallon below said base price, settlements hereunder to be computed accordingly and allowance to be made monthly for amount due during the last preceding calendar month.

South American Government Buys Local Utilities.

Montevideo, Uruguay.—The Uruguayan government has purchased for the sum of 100,000 pesos ($103,420) the electric plant at Mercedes, Uruguay, from a private company. The plant will in the future be operated by the administration of state electric plants (Administración General de las Usinas Eléctricas del Estado), with headquarters at Montevideo. The government already owns and operates the electric plants at Montevideo, Colonia, Canelones, Maldonado and Pando.

FIRE AND POLICE

City Threatened by $1,000,000 Blaze.

Johnstown, Pa.—A million dollar fire of unknown origin destroyed five buildings entirely, damaged several others, rendered scores of families homeless, put scores of firms out of their business places, resulted in the injury of a dozen or more firemen, crippled the trolley service for one-half day, and for a time threatened the business section of Johnstown. The absence of a high wind saved the greater portion of Johnstown from destruction. As it was, a light breeze carried burning embers and started fires in awnings and on roofs over an area covering several blocks in the heart of the city and as far as Woodvale, nearly a half mile distant. Rush calls for outside assistance brought the automobile chemical trucks and crews from Conemaugh, Franklin, Dale, Westmont and Windber. The visiting firemen did excellent work. Several of the Franklin boys were injured in fighting the fire. No one was seriously injured, although there were many narrow escapes. Dynamite was resorted to in bringing down the dangerous walls remaining of one of the buildings. The concussion of two heavy blasts broke scores of windows that had not been broken by the heat of the flames. A portion of a front wall fell across the automobile truck of Engine Company No. 1, crushing it to the street. Firemen and others had narrow escapes from being killed or dangerously injured. The pumper was the biggest and best of the fire department, representing a value of about $9,000. Electric current was shut off at the power plant to prevent electrocutions from trolley, telephone and electric light wires that had been torn down. Gas was also turned off wherever possible to prevent explosions and asphyxiations.

Blaze Spreads While Firemen Dispute.

Shamokin, Pa.—While firemen were contending for possession of a plug, it is alleged, a fire of a trivial nature was permitted to gain such headway as to burn out the tops of a row of four houses, rendering a like number of families homeless. The loss to the property reached several thousand dollars. The municipal authorities are investigating.

Four Firemen Injured in Lumber Blaze.

New York, N. Y.—A lumber yard fire which caused damage amounting to $50,000 lasted for several hours and was extinguished only after thirty pieces of apparatus assisted by five fireboats were brought upon the scene to combat the flames. Four firemen were injured, two being buried under a pile of fallen timber. They were dug out by their companions. Two others were cut on the arms and legs in trying to tear their way through blazing timber. The fire began to spread to other buildings, which, however, were saved. The firemen struck a difficult snag in one spot in the lumber yard, where the timber was piled many feet high. It was necessary to pull these piles down in order to get them out of the way of the flames. Lieutenant Seyforth was directing a squad of firemen in this work when a pile tumbled down on top of them.

Big Explosions Rock Cities.

Jersey City, N. J.—Jersey City and the metropolitan area were rocked by a series of explosions resulting from the burning of a five-story warehouse of the Jarvis Warehouse Co., Inc., which occupied nearly four blocks in Jersey City, within about 500 feet of the Hudson river, nearly opposite the New York city hall. The explosion deluged the Erie Railroad yards and machine shops, which adjoined them, with burning brands starting fires that destroyed two of the Erie shops, damaged or destroyed twenty locomotives and a large number of freight cars loaded with merchandise. Burning fragments, blown across the Hudson river, started small fires on the waterfront on the New York side. Over an area about half a mile in diameter about the plant in Jersey City, the streets were filled with broken window glass. The shock of the explosion was felt in office buildings in lower Manhattan and windows were shaken as if artillery was being fired in the streets below. A second explosion rattled windows again and swept the vast column of smoke over lower Manhattan and New York harbor. Several smaller explosions followed. Notwithstanding the great fire and explosion, and the fact that it did damage of more than $2,000,000, not a life was lost and not a person was even badly hurt. Mayor Frank Hague was at first convinced that the fire which caused the explosions was set by German agents, who wished to destroy Government stores in the Jarvis warehouse. Since the Black Tom explosion, Jersey City had adopted an ordinance forbidding the storing of high explosives within the city limits. The military authorities have respected this law, and high explosives, which were formerly loaded from Black Tom and other points near Jersey City, are now loaded at Perth Amboy and sent by barges between Staten Island and the Jersey shore to the outside of the harbor. E. J. Jarvis, secretary and treasurer of the warehouse company, insisted that there was not an ounce of high explosive in the warehouse. Officials of the Quartermaster's Department said they had no information of any explosives for this Government being in the warehouse. The tremendous propelling force of the explosion seemed to be directed eastward, for while hundreds of tons of burning materials from the interior of the building were scattered over the Erie yards comparatively little damage, except the breaking of glass, was done to the buildings lying inland from the warehouse. The office force of twenty-five persons heard the alarm and ran out of the warehouse in time to escape the explosion, and the foreman in charge of the workmen said that all of his hands, most of whom had been loading and unloading motor trucks, had been warned in time to get away and had been accounted for. Burning timbers, flung by the explosion from the interior of the building, fell on the Erie tracks 500 yards from the warehouse. The roofs of two great machine shops were loaded with burning debris. Several hundred persons were at work in the shops. Erie officials estimated the damage to the company at $1,000,000. The destruction of the Jarvis building involves loss, including the structure and contents, of more than $1,000,000. Goods stored there belonged to the War Department, to the Allies, and to private customers. No one was hurt except a few persons who had suffered slight lacerations from flying glass in the streets near the explosion.

Investigation finally developed that the explosions had been caused by a workman who threw a lighted cigarette on the floor while he and other workmen were weighing out loose chlorate of potash in the warehouse. The men had been told that the chemical was not explosive. One man dropped a cigarette butt and stepped on it, but the floor was covered with chemical dust which ignited and the fire spread rapidly. The men ran and then the explosions occurred. The defense of the officials of the companies storing, buying and selling the material, who were accused of violating the law by storirg explosives in Jersey City, is fundamentally that they did not think chlorate of potash would explode. Inspector Tunney, who investigated the explosion, said that explosions of chlorate of potash had occurred before, and that the substance, while not explosive in itself, was capable of forming a combination very rapidly, which might produce a tremendously powerful explosion. This explosion was one of the "telescope" type, in which a small blast produces a larger one and so on in a series of explosions of increasing violence until the explosive substance is exhausted.

Chemical Plant Fire Draws All Apparatus.

Newark, N. J.—A fire in the chemical buildings of a plant which makes picric acid and other chemicals used in the making of munitions for the government called out all the fire apparatus in Newark. When the fire was discovered by watchmen in one of the large buildings of a system of forty structures put up within the last few months an alarm for all apparatus was sent in because the plant fronts on Newark Bay, near several other munitions factories, and only about a half mile from the shipyard of the Submarine Boat Corporation, where thirty ships are under construction for the emergency fleet. When the flames were seen by the soldiers in the new system of warehouses at the shipping base of the Army Quartermaster Corps near the shipyard a detachment of soldiers was sent to the fire by Major F. H. Maphier to investigate, and to give any possible aid to the men fighting the fire. The apparatus had difficulty in reaching the fire because of the condition of the roads. The firemen, with squads of men from other factories, had difficulty in fighting the flames because of the fumes given off as they reached the vats.

Chief Suspended for Altercation.

Trenton, N. J.—Found guilty by director of public safety La Barre of three charges preferred against him by a storekeeper, chief Bennett of the fire department was suspended for five days without pay. The charges followed occurrences at a fire at the storekeeper's establishment last month. Chief Bennett was charged with using profane language, engaging in an altercation with Betor, the merchant, and with conduct unbecoming an officer and prejudicial to the conduct of the fire department. The chief entered pleas of not guilty to the charges. According to Betor, he was unaware that water pipes in his store were frozen at the time he built a fire in a range. This resulted in an explosion, which, according to witnesses, practically wrecked a portion of the structure and endangered the lives of Betor's brother, a woman and her child, sleeping on the second floor. Betor claimed chief Bennett swore at him, struck him and took him by the arm and led him to a patrolman, requesting that he be locked up. Chief Bennett denied having struck Betor, but said he put up his arm in self defense, Betor telling him as owner of the place he had a right there and that he was not afraid of the chief of the fire department. While chief Bennett denied using profanity toward the complainant, he admitted using certain words while in conversation with Betor which were classed as profanity. Chief Bennett maintained that his object in questioning Betor was to ascertain if he knew the water pipes were frozen at the time he started the fire, while Betor's interpretation of the language was that he was being accused of setting the place on fire. Chief Bennett has been a member of the department 26 years and this was the first time he had been before his superiors on charges of any nature.

GOVERNMENT AND FINANCE

Commission Form Defeated.

Burlington, N. J.—Commission form of government has been defeated here by a majority of 180 votes out of the 614 cast. About one-third of the voters took interest in the election.

Consolidation of State Boards Recommended.

Salem, Ore.—Besides recommending a number of mergers of state departments, the executive committee of the state consolidation commission in a report prepared for submission to the commission, excoriates the forestry department for playing politics, scores the industrial accident commission for employing "cheap help," pronounces the bookkeeping methods of Secretary of State Olcott "antiquated," and suggests that the commission probe carefully into the expenditures of several other state departments and boards. The consolidations recommended are: Food and dairy commissioner with the livestock sanitary board. Social hygiene society with the state board of health. Industrial welfare commission and board of child labor inspectors with the labor commissioner. Corporation commissioner with the state banking department. State sealer of weights and measures with the public service commission. Tax commission with the public service commission. State water board and desert land boards with state engineer's office or with state land board. "Oregon is the only state having such a commission, and it is a fad," continues the report in recommending a merging of the social hygiene society with the state board of health. "It is good for enthusiasts to work on, but not for a state, at least, in the manner in which it is being done." Advocating the combining of the office of state sealer of weights and measures with the public service commission the committee declares that this office was originally consolidated with the state treasurer's department. While admitting that the corporation department is conducted "apparently economically," the committee expresses the opinion that it is possible, by merging it with the banking department, "to save expense and salaries without loss and a possible increase of efficiency." It is estimated that a saving of $7,000 a year could be made by the consolidation. The reason given for recommending the merging of the tax commission with the public service commission is that the latter makes valuations of public service corporations, and that the equalization of taxes could be performed by a special deputy. The saving by a merger would total $4,000, it is asserted. Speaking of the water board, the committee states, "There is no doubt that this is one of the most extravagant offices of any of the boards," and it declares that "it is absolutely a farce to have officials of this character elected." They should be appointed, it is declared, as the "general public in voting does not know what this office means, and, with few exceptions, knows anything of the man." A consolidation of this board and the desert land board with the state engineer's office, would effect a saving of $8,000 annually, it is contended. The committee recommends a probe of the state land board, saying "a great deal of back interest, some dating for years, has been allowed to accumulate, endangering the securities held."

STREET CLEANING AND REFUSE DISPOSAL

To Fine Ash Hauling Company.

Indianapolis, Ind.—The board of public works has lost its patience with the Indianapolis Hauling Company and adopted a resolution providing that the company be penalized from $1 to $5 for each violation of the company's ash hauling contract with the city. The order became effective at once. "Under the terms of the contract," said George Lemaux, member of the board, "the board will rescind the contract if you do not give the city relief." Deluges of complaints have swamped the board of public works since December. On account of the heavy snowfall, however, the board did not feel justified in penalizing the company until weather conditions improved. Later the board put twenty city teams at work hauling ashes and charged the cost—approximately $900—to the hauling company. After this the company represented that it could take care of the work properly, and the city teams were taken off. The complaints continued to come in, however, and investigation by the board disclosed that ashes were not being hauled in accordance with the terms of the contract. The excuse of the company is that people do not put their ashes in closed containers so the ashes may be kept dry. Members of the board, however, say people have to fill up boxes, tubs, cans and every other kind of receptacles to hold ashes because the company fails to make calls every week. The company also was ordered to haul away ashes which have been dumped in alleys.

Explosion in Garbage Reduction Plant.

Syracuse, N. Y.—A mysterious explosion in one of the big steam digestors in which raw garbage is cooked partly wrecked the municipal garbage reduction plant. Six city employes, who were in the building, escaped without serious injury, although one of them was stunned by the concussion. The blast ripped away the brick walls and roof of one wing of the plant and hurled a three-ton boiler several hundred feet into the adjoining marsh. The digestor, a huge piece of apparatus weighing several tons, was shattered into fragments. The damage, according to Richard B. Williams, Jr., commissioner of public works, will run between $40,000 and $50,000. The plant was shut down and may not be rebuilt. Its capacity is limited and the city has made plans for replacing it with a modern plant as soon as the project could be financed. "The plant is not totally wrecked, but it will be impossible to operate it for some time," said commissioner Williams. "We are unable to determine yet what caused the explosion. The digestors are full of steam but there is a safety appliance which keeps the pressure below eighty pounds. Gases of some sort may have been generated from unusual substances in the garbage. Similar accidents have occurred in other plants. A tank containing 2,000 gallons of gasoline was almost under the explosion, but was not damaged. Philip Stark, plant superintendent, was able to prevent a disastrous fire by prompt and effective measures as soon as workmen could approach the buildings." The plant is owned by a referee in bankruptcy in charge of the affairs of the Syracuse Reduction and Manufacturing Company. It has been operated by the city under an agreement with the trustee since November, and extensive improvements have been made under municipal supervision.

Flying debris from the walls and roof cut through power and lighting wires of the Syracuse Lighting Company, including a high-tension cable reaching from the city to South Bay. Power was shut off on all of them to prevent accident immediately after the explosion. No fire followed it, probably because of the brick construction of the wing in which the digestors were placed. Fires were drawn from the boilers. The digestors were in a brick walled addition to the main plant, occupying the second of the three floors.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-24.—LEVEE AND DRAINAGE CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Conference, St. Louis, Mo. Secretary-treasurer, C. S. Gannon, 421 National Bank of Commerce Bldg., St. Louis, Mo.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Institute of Electrical Engineers.

A tentative program for five technical sessions has been prepared for an annual convention of the American Institute of Electrical Engineers which is to be held in Atlantic City on June 26, 27 and 28.

This tentative program was determined upon by the committee on meetings and papers at its meeting in Cleveland. The following papers will be presented if they are submitted and accepted by the committee on April 25:

Wednesday, June 26, 2.30 p. m.—W. H. Cole, "Split-Conductor Cables—Balanced Protection"; E. B. Meyer, "Overhead Cables"; H. H. Cochrane, "Wood-Stick Insulators"; G. I. Gilchrist, "The Applications of Theory and Practice of Transmission Systems."

Thursday, June 27, 10.30 a. m.—C. T. Allcutt, "Lightning-Arrester Spark Gaps"; C. P. Steinmetz, "Oxide-Film Lightning Arrester."

Thursday, June 27, 8.30 p. m.—E. Kilburne Scott, "Nitrogen Fixation"; C. P. Steinmetz, "America's Power Supply"; D. C. Jackson and N. W. Alexander, "Education."

Friday, June 28, 10.30 a. m.—V. Karapetoff, "Charged Condensers"; C. L. Fortescue, "Method of Symmetrical Coordinates Applied to the Solution of Polyphase Network"; N. S. Diamant, "Flux Distribution in Alternators Under Sustained Short-Circuit Conditions and Different Loads."

Friday, June 28, 2.30 p. m.—J. J. Linebaugh and J. L. Burnham, "Protection from Flashing for Direct-Current Apparatus"; H. S. Osborne, "The Design of Transformers for Parallel Telephone and Power Circuits."

The meeting will open at 10.30 a. m. on Wednesday, June 26, with an address by the president, and an informal reception will be held at the Marlborough-Blenheim Hotel at 8.30 the same evening.

The committee on meetings and papers has approved a proposal to recommend to the board of directors to hold a joint technical session with the American Physical Society at the annual fall meeting at Philadelphia in October.

The directors of the institute have nominated the following members to be officers for the coming year: President, Prof. Comfort A. Adams, cambridge, Mass.; vice-presidents, William E. Jackson, Chicago; Harold Pender, Philadelphia; John B. Taylor, Schenectady; F. B. Jewett, New York; Allen H. Babcock, San Francisco, and Raymond S. Kelsch, Montreal; managers—Frank D. Newbury, Pittsburgh; G. Faccioli, Pittsfield; Walter I. Schlichter, New York; treasurer, George A. Hamilton, Elizabeth, N. J. These nominations are practically certain elections.

Prof. Adams has been since 1914 professor of engineering at Harvard and the Massachusetts Institute of Technology and consulting engineer to a number of large corporations.

Minnesota Electrical Association.

The annual convention of the Minnesota Electrical Association, held at Minneapolis on March 11, 12 and 13, was a war meeting. The attendance was greater than it had been at any previous meeting.

President F. A. Otto of Albert Lea said that "the abnormal conditions caused by the war made it more necessary than ever to get members together for their mutual co-operation in maintaining the central-station industry at maximum efficiency." President Otto recommended that a fuel committee be appointed with the following objects: 1. To make a survey of the coal situation in the State as it affects public utilities. By this is meant to ascertain the amount of coal consumed annually by the public utilities and the monthly consumption, and to ascertain how much coal can be stored by each utility. This will show how much coal must be transported. 2. To co-operate with the State Fuel Administrator to secure the necessary supply of coal and to co-operate with railroad operators to keep coal moving regularly. 3. To give special assistance to association members who have difficulty in getting a sufficient supply of fuel.

S. B. Hood, superintendent of construction Northern States Power Company, read a paper on proper grouping of transformers in an interconnected secondary network. He presented a method of increasing the possible load a given distribution system can carry.

George A. Hughes, president Edison Electric Appliance Company, delivered an address on electricity as a means for conservation of labor.

Other papers presented were: "Maintenance of Electric Meters," by George Hewitt, Minneapolis; "Iron Wire Transmission Lines," Prof. W. T. Ryan, Minneapolis, and "Minnesota Water Powers," R. D. Thomas, St. Anthony Water Power Company, St. Anthony Falls.

Officers for the coming year were elected as follows: President, B. W. Cowperthwait, Faribault; vice-president, H. E. Swanson, Rochester; secretary, Fred C. Hoffman, St. Paul; directors, Emil Aveldson, supt. of the municipal electric light plant of Litchfield, and H. E. Young, Minneapolis.

New York State Conference of Mayors and Other City Officials.

Closer co-operation between the state and cities, if the state is to do its utmost in the war, was the keynote of the war meeting of the State Conference of Mayors, which met in Albany.

Governor Whitman and other state officials outlined to the city officials the methods by which they can best assist the state and national government. Mayor Burns, of Troy, president of the state conference of mayors, presided at the conference and outlined its purpose.

The first speaker was Walter H. Knapp, president of the State Tax Commission, who spoke on "City Tax Problems During War Times." "What Shall Be the Policy of the State and Its Cities Relative to Public Improvements?" was the topic taken up by Edwin Duffey, state commissioner of highways. The limitation of the use of labor and material to such a point as not to interfere with war preparations was advocated. Dr. Herman M. Biggs, state health commissioner, addressed the conference on "What Can the City Do for Health Conservation During War Times?" and H. F. Babcock, director of the bureau of food conservation spoke on "Municipal Food Campaigns."

In the afternoon in addition to Governor Whitman, who spoke on "The State and Its Municipalities During War Times," adjutant general Sherrill and state food commissioner John Mitchell spoke. Adjutant General Sherrill discussed the assistance the cities may give the military and commissioner Mitchell food production and distribution.

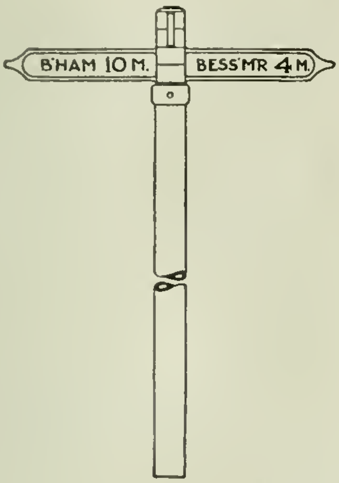
(Continued on page 271.)

NEW APPLIANCE

ROAD SIGN POST.

With Self-Locking Device.

A road sign post requiring no bolts for attaching the guide signs has been brought out by the U. S. Cast Iron Pipes & Foundry Co., Burlington, N. J. The post is made specially to resist rust and decay, and holds any number of sign boards at any desired angle. No bolts are necessary, as the device for attaching is self-locking. The post is 4 in. in diameter and 8 ft. long, and the boards 4 by 16 in. The device is known as the "Keystone Dixie" highway sign.



"Keystone Dixie" Highway Sign.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is still a tendency to cut where business is competitive. Quotations: Chicago, 4-inch, class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, class B and heavier, $52; 6-inch, $49; class A $1 extra.

Electric Hoist Manufacturers' Association.

Manufacturers of electric hoists have organized the Electric Hoist Manufacturers' Association consisting of the following companies: The Brown Hoisting Machinery Company, Detroit Hoist & Machine Company, Euclid Crane & Hoist Company, Franklin-Moore Company, Link-Belt Company, Roeper Crane & Hoist Works, Shepard Electric Crane & Hoist Company, Sprague Electric Works and Yale & Towne Manufacturing Company. The officers of the association are: F. A. Hatch, chairman, Shepard Electric Crane & Hoist Company; F. W. Hall, vice-chairman, Sprague Electric Works; C. W. Beaver, secretary-treasurer, Yale & Towne Manufacturing Company. The membership of the association is confined to those engaged in the manufacture of monorail electric hoists.

The association holds monthly meetings for the purpose of studying the specific needs of the hoist user and to develop standardized methods of presenting information. The association will consider uniform nomenclature pertaining to types and parts of electric hoists, fix upon a standard by which hoist motors shall be rated and promote the standardization of electric hoists as far as possible. It will also collect and disseminate information and statistics relative to the electric hoist industry, provide facilities and opportunities for study and education in regard to the economics of the industry, extend the use of the product by pointing out the great number of material-handling problems of different classes that can be solved by the use of electric hoists, promote co-operation among the members and disseminate information and recommend to the members well-established principles as to both construction and equipment that will tend to eliminate any possibility of inferior equipment.

The association has offered the services of member companies to the government in meeting the great demand for their product. The War Industries Board of the government has requested full information concerning the ability of the electric hoist manufacturers to handle the volume of business offered them, as well as regarding the effect of priority orders and embargoes on shipments upon the trade.

Improved Clay Pipe Installation.

With the broad object of improving installation methods for vitrified clay pipe, the **Wyatt Engineering Company** has perfected its organization and commenced manufacturing operations in Columbus, O. It is also the purpose of the company to offer its services as consultants in sewer work and other operations entailing the use of vitrified pipe. DeWitt H. Wyatt, for whom the company is named, is the inventor of the Flex-Form runner or mold, used in the rapid production of poured joints for vitrified pipe. The initial task of the company is the production of the Flex-Form and its introduction in every form of underground work where tightness in the joint is essential.

Mr. Wyatt has associated with him as an organizer of the company, W. C. Groeniger, state plumbing inspector of Ohio, and a recognized authority on the subject of house drains and house sewers. Mr. Groeniger has been requisitioned by the Federal government and is now on his way to Jerusalem to help solve sanitary problems there. Before leaving, Mr. Groeniger wrote a complete specification for the installation of vitrified house drainage, using the Flex-Form joint, as well as a specification for testing, which will be the basis of the company's propaganda for tight house drains.

It is expected shortly to announce a method of pouring grout joints that will permit immediate backfilling on large sewer operations using excavating machinery. Another of the Wyatt projects is the installation of interior vertical stacks of vitrified pipe under a specification that promises to meet every objection on the score of security and permanence.

No Bulky Exhibits at Water-Works Conventions.

No heavy or bulky exhibits will be permitted at the annual convention of the American Water-Works Association which is to be held at St. Louis, May 13-18, or at the Southwestern Water-Works Association convention which will be held at Tulsa, Okla., April 23-26. The limitation of exhibits to pictures and small samples, such as a salesman may carry, was decided upon by the exhibit committee of the Water-Works Manufacturers' Association at a recent session in New York. The step was taken in order to aid the government in relieving freight congestion.

General Electric Company, Schenectady, N. Y., is planning to erect 400 to 500 modern dwellings near its plant at Erie, Pa., which will comprise the largest of the General Electric group. The number of employes has increased to such an extent that it is necessary to erect these hundreds of buildings to house them.

NEWS OF THE SOCIETIES

(Continued from page 270)

Strong demand exists in most of the up-state cities in favor of public operation of one or more public utilities, according to reports made at the conference by representatives of sixty-nine cities. The convention adopted resolutions calling on the legislature and governor Whitman to enact a permissive municipal ownership law. "This conference of officials urges the legislature to enact a measure which will permit any municipality, after a vote by its people, to construct, own and operate gas, light, heat and power plants and street railway lines," the resolution states. "This is necessary that the residents of the cities may have a means of relief from the rate increases now being made or threatened." The conference declared in favor of the Wagner-Donohue bill. It is provided in the bill that before definite steps are taken toward acquiring or constructing municipal utilities plants, the question is to be submitted to the voters on petition. The general legislative committee of the conference at a meeting unanimously approved the bill after it had been amended according to suggestions made by the conference.

The conference of corporation counsels approved two bills to extend the powers of the Public Service Commission. One bill grants a right to the

Public Service Commission to inspect all records of utilities companies in behalf of municipalities, so that municipalities can have financial data when petitions for changes in fare are presented. The second bill authorized Public Service Commissions to suspend rate increases where a public utilities corporation has filed a schedule, pending hearings and decisions of the commission.

William P. Capes, secretary of the conference recently reviewed the legislative program to which the mayors are now committed, and for which they are actively working at the Capitol, through their advisory and general legislative committees. The mayors are concentrating, among other things, upon recommendations for the simplification of election machinery within the state, and for the reduction of election expenses. The conference has a large legislative program for this year, consisting in the main of advocacy of municipal ownership of public utilities, state control of water power resources and amendments to the Public Service Commissions law, making it more impartial and inclusive, in addition to the work for election simplification. The conference is interested in no less than two hundred bills pertaining to affairs of cities which are now the business of this session.

It has prepared ten measures, which are as follows: Bills to amend the state highway traffic act, which was passed last year; to legalize the expenses of city officials who attend conventions; two bills for uniform municipal bonds; to permit cities to make up deficiencies caused by loss of revenue from the excise tax (if cities vote "dry"); two bills to amend the Public Service Commission law: first, to permit Public Service Commissions to suspend schedules of rates filed by any public utilities company pending either an investigation by the commission or a determination after a protest filed by municipalities. The amendment requires every public utility company filing a schedule of rates to which there are objections by any municipality to make it possible for the municipality to examine the books, records, and property valuation of the corporation.

This bill, it is said, will answer the objections that have been made to the bill introduced at the beginning of the session by senator Graves, which was designed as an easement for the people in his section who were harassed by the natural gas companies and their applications for increase in rates. The Graves bill went over the head of the Public Service Commission of the Second District in endeavoring to legislate about matters then pending before the commission and did not regulate the procedure regarding rate increases by other public utility corporations, on which grounds objections were brought. The conference bill also places the burden of proof on the public utilities companies whenever a protest is made by a municipality against an increase in rates.

Bills to amend the education law to take care of local conditions in Hornell and Little Falls; to fix a minimum salary for mayors of third-class cities. In thirteen cities of the state, mayors get no salary at all, and, according to Mr. Capes, they would not be so indelicate as to ask, so the conference will be the go-between. The conference also prepared the Welsh-Murphy "home-rule" bill.

The annual conference will be held in Newburgh this year, some time in June.

American Society of Engineering Contractors.

The board of directors of the American Society of Engineering Contractors at their recent annual meeting decided to establish an office for the society in St. Louis as a more central location. From this office prompt service will be available. An assistant secretary, L. W. Helmrich, who is an engineer, has been placed in charge.

Albert P. Greensfelder, who recently became president of the society, has sent to the members and friends of the society a bulletin in which stress is laid upon the duties which, Mr. Greensfelder says, the engineering contractors should perform for the nation.

Mr. Greensfelder announces that it is his intention to reach the members frequently through the bulletin service.

PERSONALS

The Miami Conservancy District, Dayton, O., has appointed the following new engineers: Harold W. Home, since 1912 division engineer in charge of reservoir and dam construction for Hartford, Conn., and previous to that section engineer of the New York Board of Water Supply on the Catskill project; Vincent P. Odoni, of Tucson, Ariz., who has been engaged on irrigation and hydroelectric work since coming from Switzerland in 1907; Ivan P. Goodner, irrigation engineer in California, and Arthur L. Powells, of the U. S. Reclamation Service.

Chambers, John, who was at one time city engineer of Louisville, Ky., and consulting engineer, has been appointed city engineer to succeed David R. Lyman. He was in charge of the work of constructing the sewer which connects Camp Zachary Taylor with the Beargrass intercepting sewers.

Myers, C. E., district engineer, Pennsylvania state highway department, has been commissioned captain in the United States Engineer Reserve Corps, and assigned to duty at Camp Lee,

Reimer, Maj. Frederick, of the First Battalion, 104th Engineers, stationed at Camp McClellan, Anniston, Ala., has resigned from the army. He resumes the duties of county engineer of Essex County, New Jersey.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Juniata, Neb., is to build a TRANSMISSION LINE to Hastings, Neb. The engineer for the work is W. S. Watson.

Pleasant Hill, Mo., is to build SEWERS according to plans and specifications prepared by the firm of W. B. Rollins & Co.

Bids are being called for constructing the CIVIC CENTER of Baltimore, to cost about $1,000,000. The architects for the project are Carrere & Hastings.

In opposing an increase in GAS RATES, Wilkes-Barre, Pa., has retained Judson C. Dickerman as its expert before the public service commission.

A FILTER PLANT and PUMPING STATION are to be built by Westfield, N. Y. Plans are in course of preparation by the consulting engineering firm of Gannett, Seelye & Fleming.

In planning its SEWER SYSTEM and SEWAGE TREATMENT WORKS the borough of North Arlington, N. J., has had the consulting engineering services of Thomas F. Bowe.

Jacksonville, Ill., is to build an impounding DAM for its WATER SYSTEM. The consulting engineering firm of Pearse & Greeley has been retained for the preliminary work.

Lawrence County, Wampum, Pa., is to build a BRIDGE and CULVERTS. The engineer for the work is T. A. Gilken.

Vermillion, O., is to make PAVING IMPROVEMENTS. Plans and specifications are being prepared by George Champe, consulting engineer.

Concord, N. C., is to make STREET IMPROVEMENTS. The engineers for the work are the firm of Anderson & Christie.

Mount Olive, Ill., is to improve its LIGHT PLANT and construct a WATER PUMPING STATION. The engineer for the proposed work is W. S. Merkle.

Bonds for $40,000 have been approved by the voters of Fayette, Mo., for the construction of a WATER SYSTEM, plans having been completed by Burns & McDonnell.

Portsmouth, Va., is considering the purchase of the Portsmouth, Berkley & Suffolk Water Co. An APPRAISAL is to be made by Leonard Metcalf for the company and C. F. Harper, who is not an engineer, for the city. These two will decide whether to choose a third appraiser or to attempt to decide on an appraisal themselves.

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CORROSION OF SERVICE PIPES

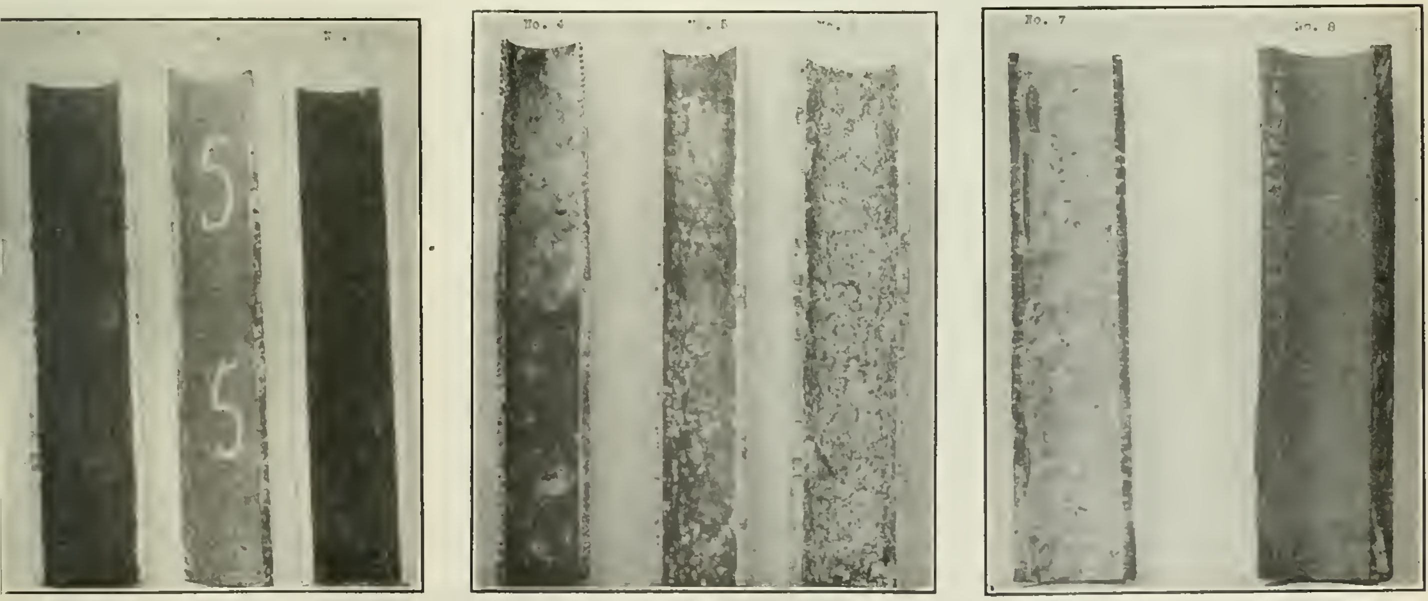
Investigation of Effect of Water Treated in Rapid Filtration Plants Upon Galvanized Iron and Lead Pipes—Low Alkalinity and Free Carbonic Acid Removes Galvanizing—Low Alkalinity Required by High Temperature.

In his 1917 report on the water supply for municipal purposes in the Canal Zone, George C. Bunker, physiologist to the Panama Canal, describes some experiments made to determine the effect of the water supplied upon lead and galvanized iron service pipes. These and the conclusions therefrom are given in condensed form below.

Some trouble has been experienced with corrosion of service pipes, presumbably due to the carbonic acid in the water, and a series of tests were made with the waters from the different purification plants. At Mt. Hope, 48 ft. of new ¾-inch galvanized wrought iron pipe was tapped into a 4-inch cast iron main running through the pipe gallery, which furnishes the supply of water for the ordinary daily use in the camp. An ordinary brass faucet was placed on the discharge end. Water was turned into this pipe on June 23 and run through it continuously, with two exceptions, at the rate of about 1 gallon per minute from 8 A. M. to 5 P. M. each day. From 5 P. M. to 8 A. M. the water stood in the pipe, the faucet being closed Each morning daily determinations of alkalinity, free carbonic acid, color and iron were made of samples of the first water drawn off in the morning, designated as "over-night" samples; also of running water collected about one hour later and designated as "running" samples. The pipe was under observation for 373 test days. Up to August the free carbonic acid in the "over-night" samples was much higher than in the "running" samples. The alkalinity was lower, and the color and iron were about equal. The free carbonic acid ordinarily ranged between 35 and 40 parts per million in the over-night samples and 3.5 to 5.0 in the running samples. After September 20 the free carbonic acid contained in the over-night samples was less than that in the running samples.

It was concluded from these tests that the effluent from this filter plant exerts only a slight corrosive action on pipe that has been properly galvanized, and will form only a thin coating on the interior. This conclusion has been corroborated by examination of the pipe used in this experiment and also of a service pipe from Cristobal.

Similar experiments were made on lead pipe with effluent at the Agua Clara purification plant, 25 ft. of new one-inch lead pipe being used. In the over-night samples the amount of lead increased to a minimum of 2.33 parts 21 days after the water was turned into the pipe, and from this time there was a decrease, and three months later



SPLIT SERVICE PIPES, SHOWING INTERIOR CONDITIONS.

No. 1.—Galvanized iron pipe removed after 5 years' service. Galvanizing removal and iron incrustation due to low residual alkalinity and free carbonic acid in filtered water.
No. 2.—Experimental galvanized iron pipe at Mt. Hope purification plant. In service one year.
No. 3.—Galvanized iron service pipe removed after 10 months' service, Ancon, C. Z. Water from Miraflores purification plant. Thin coating of iron oxide.
No. 4.—Experimental galvanized iron pipe at Agua Clara purification plant. In service one year.
No. 5.—Experimental galvanized iron pipe at Agua Clara purification plant. In service one year.
No. 6.—Galvanized iron pipe removed after 7 months' service from a house connection in Gatun, C. Z.
No. 7.—Service line to Incinerator, Gatun, C. Z. Flow through pipe about 3,000 gallons per month.
No. 8.—Experimental lead pipe at Agua Clara purification plant.

the lead contained in 19 out of the 21 samples was 0.3 parts or less. As would be expected, the amounts of lead dissolved by the water standing over night diminished as the free carbonic acid was replaced with carbonate alkalinity. Of the running samples only 3 contained as much as 0.1 part per million, and the majority less than 0.06 part. At the end of the test a section of the pipe was split, and the inside was found to be covered with a very thin coating of calcium carbonate. From these experiments the conclusion was drawn that the use of lead service pipes in the districts supplied by water from this plant is attended with no danger of lead poisoning so long as a carbonate alkalinity is maintained. It would be advisable, however, to allow the water which has been standing over night in a lead service pipe to run to waste during the first two months after its installation.

At this plant a test was made of the effect on galvanized iron pipe also. Throughout this experiment, lasting 380 test days, the alkalinities of the over-night samples were higher than those of the running samples, but the difference was always less than on the first two days, ranging from 1 to 11 parts. The colors of the over-night samples also were always higher than those of the running samples. They were also always higher in iron.

Gravimetric determinations of zinc were not made on the water from the galvanized iron pipe, but at the end of the run the residue from 100 c. c. of an over-night sample was tested micro-chemically and zinc crystals obtained; while a similar test of a sample of running water, collected on the same day, showed the absence of zinc. There was a cloudy appearance of the over-night samples that may be explained by the presence of iron and zinc in suspension.

While it was known that galvanized iron was not suitable for service pipes with a filtered water of low alkalinity and a free carbonic acid content of 5 parts or more, on account of the removal of the zinc and corrosion of the iron, it was thought that if a normal carbonate alkalinity were maintained the corrosive action would be slight and the physical appearance of the water standing one night would not materially differ from that running a few minutes. It was observed, however, that while the over-night water was not colored yellow to the extent that it was prior to the removal of the free carbonic acid, yet it presented a slight milky appearance and was not as clear as water drawn off a few minutes later. At the end of the test this pipe was split open for examination, and at the end bearing the brass faucet there was a uniform soft deposit of a brownish color that shaded off to a cream color about one inch back. This was undoubtedly the result of galvanic action. It is reasonable to assume that particles of this soft deposit might have been loosened when the faucet was opened in the morning, thereby accounting for some of the higher iron contents. The zinc coating on the interior of the pipe was in good condition with the exception of a few small pin-head deposits. There was a very thin slate-colored coating over it. A section cut from about mid-length of this pipe did not contain any rust, but was spotted with cream-colored tubercles ranging in size from a pin-head to irregular deposits ⅜-inch long, ¼-inch wide and 1/16-inch thick. Near the cast iron main the thin coating over the zinc was colored brown in spots and cream-colored tubercles also were present. The interior surface of this piece was much rougher than that from the mid-length of the pipe, and it was evident that dross from the spelter bath had adhered to the surface.

Examination was made of a one-inch galvanized iron pipe that had served as a service to a cottage for about six months. About 12,000 gallons of water per month had passed through this pipe. A piece was also cut out of another service about 1,000 ft. long which had been in use about seven months. The condition of these two pipes was such that the continual use of galvanized iron pipe was considered inadvisable, not on account of the corrosion of the zinc coating, but because the soft deposit will reduce the capacity in a comparatively short period. The rate of accumulation of this deposit varies with the amount of water passing through the pipe, the smaller the flow and the greater the periods of time between discharges, the more quickly the incrustation forms.

It is evident that at the temperature of water prevailing in service pipes in the tropics (24 degrees to 30 degrees Centigrade), the normal carbonate alkalinity as $CaCO_3$ must not exceed 8 parts per million as a provisional standard, with the possibility that this limit may be too high; instead of the 13 parts given by Whipple as a maximum beyond which precipitation will occur.

A piece of one-inch galvanized iron pipe which had been in service for five years was found to be covered on the interior with a rust-colored deposit from 1/16 to 3/16 of an inch thick. All of the zinc coating had disappeared. This furnished an excellent illustration of the action of a soft water that had been treated with alum with the resultant residual alkalinities varying from 2 to 10 parts per million and containing an average of 6 parts per million of free carbonic acid.

PUBLIC WORKS AND THE CITY ENGINEER.

All public works of Indianapolis, Ind., except those connected with sewage treatment and garbage disposal, are under the jurisdiction of a board of public works consisting of three members appointed by the mayor. The activities of the board are divided among six departments or subdivisions, these being the bureau of assessments, municipal garage, department of street cleaning, city engineer's department, street department, and public building operation. In a report made recently for the Indianapolis Chamber of Commerce by the New York Bureau of Municipal Research, the following comments were made upon the relation of the city engineer to the board, and especially the street department:

"The city engineer's department is responsible for highway design and construction, while the street commissioner's department is responsible for highway maintenance. Both of these departments are under the control of the board of public works. Similarly, the same situation exists in respect to the construction and maintenance of sewers.

"Considerable confusion in the procedure relating to permits and the inspection and replacement of permit openings results from this decentralized control.

"The functions exercised by the street commissioner's department, consisting briefly of highway maintenance, sewer maintenance, bridge maintenance, and the replacement of permit openings, are all engineering functions which should be supervised and controlled by an engineer and the methods to be employed should be recommended by engineers. In spite of this fact the street commissioner's department does not contain any engineering positions and the personnel is composed of other than technically trained men.

"The city engineer's department contains a force which is almost entirely composed of engineers of various degrees of training and experience. Despite this, the operations of the street commissioner's department are carried on without the aid of engineering service except through suggestions volunteered by the city engineer or advice requested by the street department. The extent to which the technical advice of the engineer's department is made available for use by the street department depends entirely upon the degree of co-operation existing between the two departments and their administrative officers.

"The fact that the heads of these two divisions or departments occupy co-ordinate positions might easily lead to interdepartmental jealousy and antagonism not at all conducive to the maintenance of a spirit of co-operation. Even though a high degree of co-operation may exist, it is unsound to divide the responsibility for construction from the responsibility for maintenance in connection with any public works undertaking.

"It is recommended that the street department or the street commissioner's department be abolished as such and that the functions performed by such department be absorbed into the city engineer's department.

"The abolishment of the street department should be accompanied by the abolishment of the title and position of street commissioner.

"A more appropriate title for the combined departments would be 'engineering department' rather than to retain the title of the city civil engineer with the name of the department, for the reason that the work is not entirely confined to civil engineering activities. This is recognized to be a point of little importance, however, and is not vital in connection with the reorganization."

At another point in the report it is stated: "The asphalt used in the maintenance of asphalt streets is manufactured in the city asphalt plant, which is controlled by the street commissioner's department. The city engineer's department includes in its organization an engineering chemist in charge of the testing laboratory. This engineering chemist acts as a staff-advisor in connection with asphalt specifications and the construction of asphalt streets. The advice of this office may or not be accepted by the street commissioner in connection with the operation of the city asphalt plant, depending upon the degree of co-operation existing between the two departments. This situation is a further proof of the illogical division of responsibility between the construction and maintenance of highways, especially of asphalt streets."

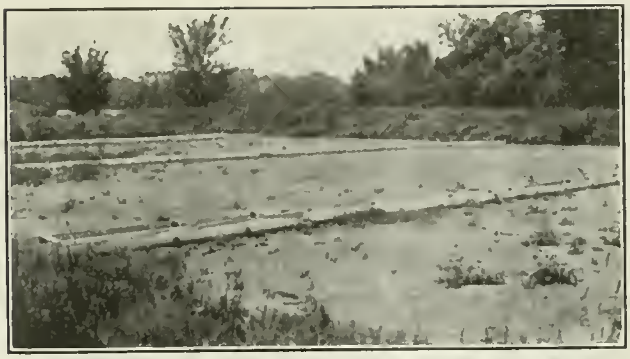
OPERATION OF SEWAGE WORKS IN IOWA*

Recommendations Relative to Septic Tanks, Imhoff Tanks, Sludge Beds and Intermittent Sand Filters—General Suggestion for Operating Plants.

2. SEPTIC TANKS.

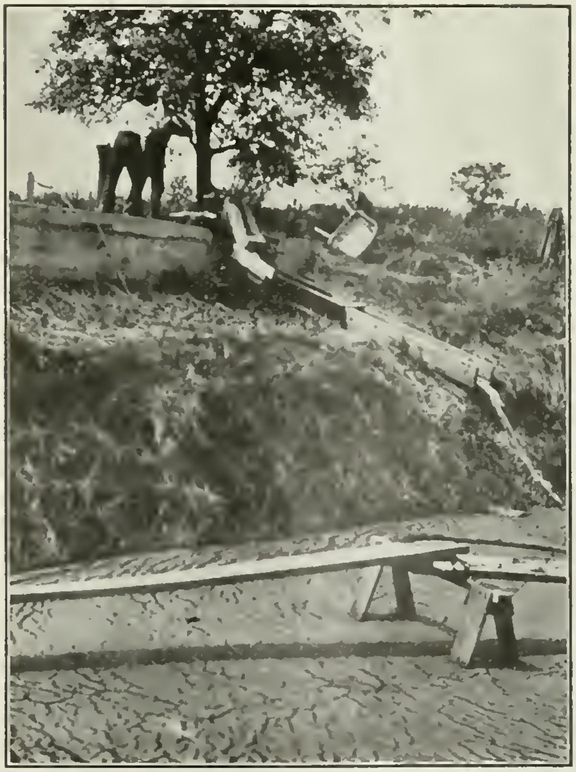
The impression still remains in the minds of many city officials that septic tanks are cure-alls. One town council was found during the past summer with such confidence in septic tanks that just the possession of them was thought sufficient without actually running the sewage through the tanks. These tanks, built in 1913, had been by-passed ever since their construction.

It is of course well known now by all those at all acquainted with the subject that septic tanks are useful only in providing preliminary treatment for sewage. As with the grit chamber, the old-fashioned slab cover with a few manhole openings must be abandoned. No septic tank should be constructed which cannot be entered readily at all times. This requires a cover of such height above the sewage that the operator may walk erect upon the runways over the tank. The inlet channels to the septic tanks should be so designed that they are self-cleansing. Rectangular cross sections and slow velocities allowing deposits are to be avoided. Since most of our Iowa plants suffer from excessive infiltration of ground water during a long period in the spring, ample overflows must be provided, so that the septic tank may never work at a higher rate than it should. This subject of overflows has in the past received practically no attention in Iowa plants. Accordingly, during the spring, septic tanks either are by-passed, or their contents are so agitated by the flood of sewage and ground water entering them that the rest of the plant is permanently injured by the high amount of sludge carried out of the tanks through the siphons over onto the sand beds.



FAIRFIELD. THREE SAND FILTERS WITH NO RIDGES SEPARATING THEM.

Ample provision should be made for the proper removal of sludge. This means, first of all, a sludge bed large enough for any use to which it may be put. With tanks designed with nearly level bottoms, as has been the custom in the past, it becomes necessary in sludging out the tanks to empty their contents upon the sludge bed. Of course one hears the wise advice that only small amounts of sludge should be removed from such tanks at a time. If any one has ever attempted to do this in Iowa tanks, where only a foot to two feet of clearance is available between the surface of the sewage and the cover, one knows how impracticable it is to



FAIRFIELD. PUMPING OUT TANK THAT WAS SLUDGED UP.

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*Continued from page 257.

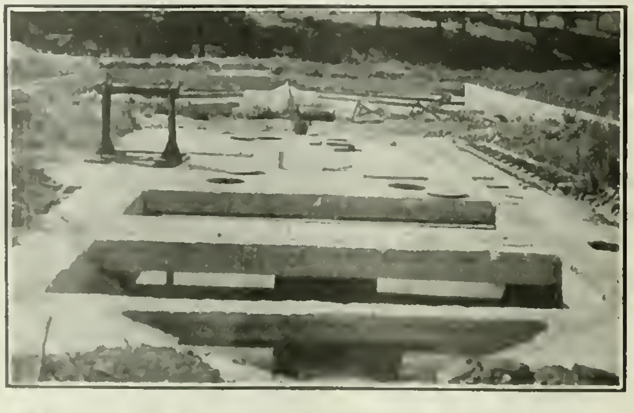
carry out this plan. One great advantage to be gained by doing away with this low slab cover is the comparative ease with which the sludge problem may be handled. The design of the slopes of the bottoms of septic tanks should be more carefully studied. The use of hopper-shaped bottoms should be more frequently found. The valves should be more conveniently located. The usual plan of having one valve at one end of the tank makes removal of the sludge unnecessarily difficult. If but one valve can be used, a much better position for it would be between the inlet and the center of the tank, but nearer the center, with the bottom sloping properly toward the valve.

All the valves used in septic tanks or in any other part of the disposal plant should be so made as to be operated easily. It has been the custom in the past to attempt to save money by using cheap sluice valves of poor design. It would be a good plan if the designing engineer were compelled, after two or three years, to return to the disposal plant which he has designed and, in case any valve is found which cannot be opened easily in two minutes, he should receive a jail sentence.

Frequently the designing engineer has apparently given little time to the study of the proper sizes of the two tanks which are usually found in Iowa plants. In most cases were such a study made it would be found advisable to construct one of the two tanks smaller than the other. To construct two tanks of the same size usually presupposes that the entire present population is to be connected at once to the sewers. The facts of the case are that after several years there may be only 50 to 75 per cent of the population connected. By properly proportioning the small tank, over-septicization of the sewage may be avoided. The old-fashioned flowing-through period of twenty-four hours injures the sewage for subsequent treatment upon filter beds. A period of flow of six to eight hours is an average requirement for Iowa conditions.

3. IMHOFF TANKS.

As with septic tanks and grit chambers, so with Imhoff tanks—the flat slab cover must be dispensed with. Every part of the Imhoff tank must be readily accessible. With some plants the side walls of the sedimentation basins must be cleaned and the slots opened once a day. With other plants once a month is sufficient. It is essential in constructing the sedimentation chamber that the surfaces upon which the solids settle should be finished smooth. The slopes of the bottoms of the sedimentation chambers should not be too flat. A wide enough slot at the bottom of the chamber should be planned so that the sludge may not readily clog it up. One large Imhoff tank plant visited during the past summer has been constructed without much attention to smooth surfaces in the sedimentation chambers. The ridges between the boards on the forms were nearly all in evidence. Two results are sure in such a case. First, the walls and aprons of the sedimentation chambers cannot be properly cleaned. Second, due to the fact that the sludge deposited is not all removed, some of it will become septic, and when gas-filled will rise to the surface, thus interfering with the proper efficiency of sedimentation.



NEWTON. IMHOFF TANK WITH OLD FLAT SLAB COVER CUT AWAY. TWO SAND FILTERS IN BACKGROUND.

The design must be so worked out that there are no sludge or gas pockets underneath the walls comprising the sedimentation chamber. Such sludge or gas pockets are frequently found in tanks provided with double sedimentation chambers with chimney gas vents between the chambers. The sludge and gas collecting in these pockets will eventually cause trouble by coming up through the slot in the bottom of the sedimentation chamber, thus interfering with the fundamental purpose for which Imhoff tanks are designed.

Wherever possible, there should be an emergency drain pipe so designed and constructed that the level of the sewage in the tanks may be lowered easily below the slots of the sedimentation chambers. In this way tedious and expensive pumping is avoided in case it becomes necessary to empty these sedimentation chambers in order to clean the slopes and open the slots, or to remove obstinate sludge from the digestion chambers.

Probably every Imhoff tank ought to be constructed with such connections to water under pressure that the sludge in the bottom of the tank, together with the sludge immediately underneath the bottom of the sludge pipe, may readily be broken up and agitated. Without such a connection to water under pressure, it has been found sometimes difficult to start the sludge out through the sludge pipe. Furthermore it has been found that as soon as the sludge came out, a cone of sludge was removed at the bottom of the tank, thus permitting raw sludge and even raw sewage to escape through the sludge pipe instead of the well-ripened sludge further out from the center of the tank. By loosening up the well-compacted sludge at the bottom of the tank by water forced under pressure through a grid, the formation of this cone may be controlled.

4. SLUDGE BEDS.

In connection with the discussion of septic tanks, it has been pointed out that sludge beds for septic sludge should have such areas that all of the requirements of operation may be satisfied. This statement also applies to sludge beds for Imhoff tanks. Before the sludge bed can be properly designed, the plan of operation for septic tanks or Imhoff tanks must be thoroughly worked out. All possibilities must be investigated.

The flow line of the inlet carrying the sludge upon the bed should be high enough above the surface so that the sludge will not back up in the sludge pipe, and thus with accumulated deposits ultimately stop it up. Distribution troughs are unnecessary for sludge from either septic tanks or Imhoff tanks.

The sludge beds should be as porous as possible. An inch or two of sand upon the top of about a foot of properly graded material is common practice in the large Imhoff plants in the east. Of course, immediately in front of the inlet must be placed a flat slab or baffling device to spread out the incoming flow of sludge, thus decreasing its velocity and preventing scour of the material composing the sludge bed.

The practice at many plants of sludging out tanks directly into drainage ditches or creeks should be discontinued. Sludge beds should be constructed and used, even if pumping is necessary. No direct by-pass of sludge to creeks should be included in the design of the plant.

5. SIPHON CHAMBERS.

A primary necessity for siphon chambers is that all parts of them be readily accessible. Accordingly the old-fashioned flat slab cover, close down to the surface of the sewage, must be abandoned. In case a flat slab cover is to be used, it should be at such a height that the operator may stand erect within the tank in carrying out the repairs frequently necessary upon the siphons and in flushing out the interior. Flushing connections are necessary, due to the accumulation of light, flakey sludge settling out of the effluent from sedimentation tanks upon the floors of the siphon chambers. The flushing valves should be so situated that the slope of the floor is toward the valve. In at least one plant in Iowa the sludge cannot be removed from the siphon chamber without considerable labor, since during construction the inspector did not insist upon the contractor constructing a smooth floor with the proper slope. Of course, a by-pass for the effluent from sedimentation tanks should be included in the design of the siphon chamber.

The word "automatic" siphon is a misnomer. While such siphons will operate automatically, occasionally for long periods of time, yet at any moment the proper alternation of the siphons may cease. Accordingly all piping, vents, blow off traps and starting wells should be so located as to be easily accessible. In many plants in Iowa it is so difficult to get at the siphons and their auxiliary connections that they are very naturally neglected. This means ultimately trouble and expense. For instance, unless it is easily possible to operate all of the valves upon the piping, they are likely never to be moved from one year's end to another. In this way they may become immovable.

6. INTERMITTENT SAND FILTER BEDS.

A great many filter beds in Iowa are overworked. Engineers differ concerning the area which should be provided. The state board of health has concluded from the information which has thus far come to its notice that under Iowa conditions with ordinary residential sewage from our small towns, intermittent sand filters may be operated at a rate of 200,000 gallons per acre per day. This assumes that one acre of sand filter will care for the sewage from 2,000 people. On the average 50 gallons per capita per day of domestic sewage is found. During wet weather this is increased for long periods of time by about 50 gallons per capita per day of ground water infiltration. Thus in the wet seasons of the year the amount per capita expected is about 100 gallons per capita per day. For short periods of time much higher rates are common.

Many filter beds have berms four to five feet wide at the top with slopes 1½ : 1 around each individual filter bed. When beds are symmetrically located side by side, much area may be saved if they are separated by sand ridges ten or twelve inches high. No inconvenience in operation has been found where this method has been consistently followed.

In selecting sand for sewage filters, the State Board of Health should be consulted. A study has been made of many of the sand deposits in Iowa and the requirements for filter sand have been adjusted to suit average Iowa conditions.

One common fault in the operation of filter beds in Iowa is the uneven distribution of the sewage over the surface of the bed. Two types of distributors are in common use, the plank trough distributor, and the sewer tile distributor. The plank trough distributor is commonly installed with branches leading out, ostensibly so as to cover well the surface of the bed with the incoming sewage. In actual operation these branches are sometimes removed and a single line of plank trough left down the center of the bed. In many cases these plank troughs are in a bad state of deterioration. In some instances they have been frequently floated out of place by the filters being flooded either from high water in the creeks or by infiltration of ground water into the sewers. In such cases the operator may not return them properly to place or properly to level. In general, the tile distributors, especially those consisting of a single line of tile down the center of the beds, were found to be giving better service than the plank distributors. The operators of the plants, however, need instruction as to how to alter the flow through both tile and plank distributors so that equal amounts of sewage may reach equal areas.

In some instances the banks around the filters were found to be washed down upon the surface of the sand with every rain. In such cases a trench should be made at the bottom of the slopes of the banks deep enough to intercept the wash from rainfall. After each storm this trench shall be cleaned out. In this way the sand surface itself will not become clogged. Of course the permanent remedy in such a case is to sod the banks.

In case the filter bed becomes flooded, under no circumstances should holes be made in the sand so that the sewage may find its way directly to the underdrains. This idea was tried out not long ago by the operator in charge of the plant at Grinnell. The result is easily imaginable. The underdrains were clogged and the filter beds put out of commission. Furthermore, spading of beds or plowing of beds should not be permitted. The surface should be stirred only to a depth of half an inch. This may be done, in case the surface mat becomes water tight, either with garden rakes or by a harrow and horse with the harrow specially constructed so that it would be impossible to work the sand deeper than half an inch. The driver must not be permitted to stand upon the harrow, since the sand would almost certainly be stirred too deeply. Of course, garden cultivators, stirring about three inches deep, should not be tolerated.

In the winter operation of beds in Iowa in the past, two methods have been followed. It is feared that the most common method has been to by-pass the beds directly into the creeks. This should be discontinued, since it defeats the purpose for which sewage treatment plants are designed. The second method used has been to ridge the beds so that the ridges might support the ice which forms during long continued cold weather. This year some of our plants are trying with success the pile method. This plan has been used for many years in large plants in the East. At the time of the last thorough fall cleaning before freezing weather sets in, the dirty sand and surface mat which is scraped up is left in piles, six to eight inches high, three to eight feet apart. It has been found that these piles support the ice and provide

IMPERFECT DISTRIBUTION ON FILTER. GRINELL.

small channels around their bases so that the sewage finds its way out beneath the ice cover over the surface of the sand.

GENERAL SUGGESTIONS.

In this discussion of some of the features of operation and design of this imaginary composite Iowa sewage treatment plant no attempt has been made to cover the field of operation and design completely. The books now available make any such attempt superfluous. Such scattering observations as have been made represent conclusions which any one might reach if he had the same opportunity of visiting so many plants within so short a time.

Viewing this composite sewage treatment plant as a whole, certain suggestions may be made. Every plant, no matter how small, should have included in its equipment a tool house. Of course, the superstructures of sedimentation tanks may be so designed as to serve this purpose, but usually no place is available to store the few implements which are required around the plant. Furthermore, the operator needs some protection from inclement weather. In this house the operator may make out the reports which ought to be required. Here he may carry out the simple tests which he ought to make. For instance, tests upon the efficiency of operations of the sedimentation tanks should be made. Probably the test which will in the long run prove most satisfactory (although it has certain drawbacks) is the use of the conical Imhoff glasses.

These glasses are about 4 in. in diameter at the top and 17 in. high, and have a capacity of one liter. By placing one liter of raw sewage in one glass and the same amount of tank effluent in the other, after two hours the cubic centimeters of settling solids are read. The removal of settleable solids ought to average 95 per cent.

Furthermore, the relative stability of the effluent from the sand filters and perhaps of the water in the stream above and below the outlet ought to be determined. The methylene blue test for relative stability is so simple and yet so useful that it ought to be part of the weekly routine of the operation of all plants, no matter how small. A 0.05 per cent solution of methylene blue, preferably the commercial double zinc salt, is used. This is obtainable at any drug store. About 150 cc. of sewage is placed in a glass-stoppered bottle with all air excluded. After adding 0.4 cc. of the methylene blue solution, the mixture is kept at room temperature. It is observed regularly to determine how many days it will retain the blue color. Ten days' retention of color is rated at 90 per cent relative stability. This means that the sample contains 90 per cent of the available oxygen required for perfect stability. The following table gives the relation between the time in days required to decolorize methylene blue at 68° F. and the relative stability number.

*Relative Stability Numbers.

Time required for decolorization at 68°F. Days	Relative Stability Percentage
0.5	11
1.0	21
1.5	30
2.0	37
2.5	44
3.0	50
4.0	60
5.0	68
6.0	75
7.0	80
8.0	84
9.0	87
10.0	90
11.0	92
12.0	94
13.0	95
14.0	96
16.0	97
18.0	98
20.0	99

The sludge levels in the sedimentation tanks should be measured regularly. The engineer should leave with the operator devices for this purpose, such as a graduated cord or wire with a weighted board or iron plate attached in such a way as to remain horizontal. No plant visited possessed anything of this kind.

Certain industrial wastes must be guarded against. Grease from garages and waste from creameries and from gas plants must not find their way directly into the sewage treatment plant.

Some means must be provided for measuring the flow through the plant. In some cases an ordinary weir will enable this to be done. Another simple plan is to have some sort of float-operated recording device in the dosing chamber. Simple devices are upon the market for recording in this way the number of flushes which take place. By knowing the capacity of the siphon chamber, a fairly accurate knowledge of the rate of flow through the plant is obtained. It is strange in how few plants any idea exists as to the one fact which is most fundamental of all, namely, how much sewage is being handled. Of course the rate of flow through sedimentation tanks may be studied with the use of dye.

In many cases more attention ought to be paid to simple means of beautifying the grounds about our sewage treatment plants. The plant at Mount Vernon is an example of a successful attempt of this kind. Here a small amount of shrubbery has been obtained at little or no expense, and by its presence at the plant tones up the whole place.

Finally, this composite Iowa plant should have every by-pass sealed by the State Board of Health. Whenever such a seal must be broken, a written report, stating the cause, should be made to the Board within twenty-four hours. For violating this rule a severe fine or imprisonment, or both, should be fixed by law. The by-passing of sewage treatment plants has become a matter of course. The dictates both of law and of common sense are thereby transgressed with no compunctions of the community conscience whatsoever. The remedy recommended, though drastic, would correct much of the present carelessness and thoughtlessness.

(To be continued.)

NAMING COUNTRY HIGHWAYS.

A generation ago, before the development of the automobile, comparatively few city dwellers visited the country highways and few country dwellers traveled with any frequency beyond the immediate vicinity of their homes. Under these conditions, the necessity of signboards and other means of identifying country roads was not nearly as great as at present. Nowadays, however, the owner of the automobile travels over and passes the intersections of as many country highways in an afternoon as his father did when travelling on foot within city limits.

This suggests that, just as it is desirable to introduce some method in the naming of city streets and the numbering of properties thereon, so a similar method should be employed for naming country highways and locating the farmers' private holdings past which they run. Probably reasoning along these lines, a committee in St. Joseph County, Indiana, has recommended to the county commissioners that all the rural highways in that county be named after a regular system as follows: Roads running east and west and north and south will be designated as roads, while those which run diagonally will be called highways. The naming of north and south roads will begin at the east line of the county and that of the east and west roads at the north line; and the numbering of farm houses will begin at the same points. North and south roads will be named after trees, shrubs and flowers, the names being arranged in order alphabetically; for example—Ash, Birch, Cypress, etc. In that state most of the roads follow section lines, and these will be named after trees. Where there are roads intermediate beyond these mile-apart roads, such intermediate roads will be named after shrubs and flowers. As each letter indicates one mile, the initial letter of the name of any road will tell how many miles it is from the east or north line of the county. The east and west roads will be named for United States presidents, governors of Indiana, Indiana statesmen and Indiana authors, and will follow the same alphabetical plan.

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* Standard Methods of Water Analysis: Amer. Pub. Health Assoc. 1917, p. 70.

CENTRIFUGAL PUMPS OF ST. PAUL WATER DEPARTMENT

Test of Electrically Operated Plant with Capacity of Fifteen Million Gallons a Day—Single-Stage Centrifugal Pumps Used.

The Water Department of St. Paul has recently installed an electrically operated pumping plant that has a capacity of over 10,000 gallons per minute against a total head of 171 feet, or about 15,000,000 gallons per day. The plant is located at the McCarren Pumping Station. The following figures showing efficiency and other characteristics are from a report by J. W. Kelsey, principal assistant engineer, to G. O. House, general superintendent of the water department.

There are two 12-in. centrifugal pumps, the specifications for which required that each deliver not less than 5,000 gallons per minute against a total static and friction head of 171 feet, and not more than 5,500 gallons against a head of 158 feet, with an overall efficiency from "wire to water" of not less than 72 per cent when pumping continuously under either of the conditions named. It was further required that if the head fell to 140 feet the motor should not be overloaded.

The successful bidder, the Northwestern Electric Equipment Co., guaranteed an efficiency of 74.3 per cent at either 158 or 171 feet head, and an overall efficiency of 73.7 per cent at 140 feet. The company furnished pumps manufactured by the De Laval Steam Turbine Co., of the single-stage double-suction volute type, having 12-inch suction and discharge nozzles. No diffusing vanes are used. These are operated by synchronous motors of the rotating field type manufactured by the Electric Machinery Co. of Minneapolis. The motors receive three-phase, 60-cycle current at approximately 2,200 volts and drive the pumps at 1,200 r.p.m. They are so designed that they can be started by the application of alternating current to the armature windings. In normal operation they are supplied with exciting current by directly connected exciters of 1¾-kilowatt capacity.

After installation, both units were subjected to very complete tests to determine both efficiency and head-capacity characteristics. Before the official tests were run the impellers had been turned down slightly in diameter, due to the fact that the motors were operating at 20 r.p.m. above rated speed.

Before beginning the test, the pressure gage of each pump was taken off and calibrated on a dead weight testing instrument, and then replaced. The static head of water was determined by finding the elevation of the center of the gages and the elevation of the water in the high service reservoir. The head determined from the elevations was found to agree with the calibration obtained with the dead-weight testing instrument. The readings of the suction gages also were checked against elevations in a similar manner, and found to be correct. As they registered zero with no pressure, and as the variation in head was never more than 10 ft., it was assumed that readings of the gages between zero and 10 ft. would be proportional.

The quantity of water delivered was measured by a 30-in. by 13-in. Venturi meter, supplied by the Builders Iron Foundry Co., of Providence, R. I. The recording instrument supplied with this meter includes an indicating dial, a recording card and an integrating counter, but in order to verify the accuracy of its readings, an indicating mercury manometer was also connected to the pressure pipes of the Venturi tube.

The electrical measuring instruments were checked and calibrated subsequently by comparison with standard instruments by representatives of the Northern States Power Co.

In running the test, the head against which the pumps worked was controlled by means of a hydraulic gate valve on the discharge side of the pumps. After throttling the gate valve no readings were taken until all instruments had ceased fluctuating, after which two or three readings were made and averaged, if any variations were found. Observations were made with the pumps operating under four different heads, covering a wide range of delivery.

The results obtained on the official test are shown in the tabulation given below. In computing the efficiencies of the pumps alone, motor efficiencies, as obtained on tests of the motors by the University of Minnesota, were used. On motor No. 403,115, the following efficiencies were obtained:

Full load, 95.5 per cent, three-quarter load, 94.9 per cent, one-half load, 93 per cent.

Motor No. 403,129 gave the following results:

RESULT OF OFFICIAL TEST OF PLANT.

	Motor No. 403,129—Pump 25,651				Motor No. 403,115—Pump No. 25,650			
Volt Meter	2230	2230	2240	2240	2250	2260	2270	2295
Rec. Watt hr. meter	234.0	225.0	210.0	165.0	224	217.4	204.8	188.1
A. A. Ammeter	62	59.5	55.5	44.5	57.6	56	52.4	47.8
P. F. Indicator per cent	100	100	100	100	100	100	100	100
Ind. Wattmeter	233.3	226.2	210.1	165.3	226.3	220.2	206.0	188.9
Vent. Manometer	9.75	8.50	7.25	4.60	9.4	8.24	7.1	5.9
Press. gage ft	147.25	165.25	179.25	195.75	146.5	163.0	176.5	186.0
Suc. gage ft. press	4.0	6.0	7.5	10.0	3.2	5.0	6.5	8.0
Total head feet	143.25	159.25	171.75	185.75	143.3	158.0	170.0	178.0
R.P.M.	1220	1220	1220	1220	1220	1220	1220	1220
G.P.M.	6771	5900	5035	3194	6527	5722	4930	4097
Water H. P.	245.1	237.5	218.4	150.0	236.4	228.7	211.9	184.3
Electrical H. P.	312.9	303.3	282	221.7	303.4	295.2	276.1	253.1
Overall Efficiency	78.4	78.3	77.7	67.7	78.0	77.5	76.4	72.8
B.H.P.	298.5	289.6	269	209.9	289.0	280.8	262.2	239.3
Pump Efficiency	82.2	82.1	81.2	71.5	81.8	81.5	80.7	77.0

Full load 95.3 per cent., three-quarter load, 94.6 per cent, one-half load, 92.5 per cent.

The test results of the units show the variations in head and capacity at constant speed together with electrical horsepower input and overall efficiencies.

The efficiencies obtained on these pumps are quite high, considering the comparatively small capacity and the high head. Many builders would advocate the use of diffusing vanes for such conditions; but these would make the pump more expensive and complicated without, it was believed, any gain in efficiency. The efficiencies are further very high over a considerable range in rate. Take for instance, pump No. 25,651, which, at a rate of 6,527 g.p.m., shows an efficiency of 81.8 per cent, and, at 4,097 g.p.m., an efficiency of 77.0 per cent; or, for a reduction in rate of about 37 per cent, there is a reduction in efficiency of only 5.9 per cent, which must be considered very good for a centrifugal pump.

The pumps deliver slightly more than 5,500 g.p.m. at 158 feet total head, but this was not objectionable in view of the fact that the efficiency was very high also at low heads, which in this particular case was of great advantage, as can be seen from following quotation from the official report:

"As to the quantity of water pumped, it will be observed that it more than meets the requirements of our specifications. The clause in our specifications limiting the quantity of water to 5,500 gallons per minute when working against a head of 158 feet was inserted to insure a high efficiency at this pressure. It was our belief that the maximum efficiency would be obtained when pumps were working against a much higher head. Fortunately, however, the reverse is true, and our pumps are delivering a greater quantity of water, with a higher efficiency than was anticipated at the lower heads.

"As stated before, the friction loss in our force mains is less than computed, with the result that our operating head is somewhat lower than provided in our plans, which explains one of the main reasons for reducing the effective diameter of the impellers. The consequence is a greater quantity of water, at a higher efficiency against our prevailing dynamic heads."

WATERLOO'S SEWAGE PUMPING STATIONS

Description of Three Small Plants, Cost of Same, and Experiences in Operation—Motor Driven, Automatically Stopped and Started.

Waterloo, Ia., pumps in small amounts at three different stations, such pumping being rendered necessary by the same conditions as require it in other cities—the existence of small areas of land too low to drain into the system by gravity. In a paper before the Iowa Engineering Society, assistant city engineer G. H. Kilpatrick described these stations and their operation, from which paper the following is abstracted:

A section known as Cedar River Park, containing approximately 30 acres, was annexed to the city in the year 1913. When an attempt was made to sewer it, it was found that a small part, which it is estimated will contain 102 dwellings ultimately, was too low to reach this system by gravity and a pumping plant was installed, it being estimated that it would serve 510 persons contributing 80 gallons of sewage per capita per day. A submerged centrifugal pump, motor driven, vertical shaft type, with a 6-inch suction and a 4-inch discharge, manufactured by the American Well Works, was installed, driven by a 7½ h.p., 60 cycle, single-phase, 220 V., A.C., Wagner motor, equipped with an automatic controlling device. The sewage is received in a well with a storage capacity of 2,160 gallons. Two vertical screens, made of No. 4 galvanized wire on substantial iron frames held in place by groves in concrete pilasters extending 4 ft. above the floor of the reservoir, divide the pump from the main part of the storage well. The concrete reservoir cost $700, the pumping outfit complete cost $505, and the brick house enclosing them cost $265.

In the early winter of 1917, 86 persons were occupying this area. Between January 20th and February 20th of 1918 the average daily amount of sewage pumped was 2,004 gallons, and the pump operated 57 times, or less than twice a day. The first winter after the station was put into operation the amount of sewage was much less than this and considerable trouble was experienced from freezing because of the long time that the sewage lay in the reservoir before being pumped. To overcome this difficulty, a hot water radiator was placed in the reservoir, heat being supplied by a gas heater. With an increased quantity of sewage entering the reservoir, this trouble has disappeared. Another objectionable feature due to the infrequent pumping was caused by the putrefying of the sewage in the reservoir, the odors therefrom escaping through the ventilator of the building and causing some discomfort to those residing near the station, especially in warm weather. Mr. Kilpatrick suggests that it would be advisable to provide a water connection into a station of this kind, which would permit the use through a hose of water under pressure by which, aided by a brush, the side walls of the reservoir and the pump could be cleaned of any deposits.

Another pumping station serves only 31 residential lots and is enclosed on three sides by public park property. When the building was planned, however, a part of the land was still owned privately and it was estimated that it would be laid out into about 110 additional lots, and provision was made for pumping 27,125 gallons a day.

In this plant the roof of the reservoir is 4 ft. beneath the natural ground level. The reservoir is circular, 7 ft. in diameter, and has a storage capacity of 1,010 gallons. It is surmounted by a circular pump house 6 ft. in diameter, built of hard red brick and having a galvanized roof. The equipment consists of a 3½ h.p., 60 cycle, 104 V., A.C., Century motor, with an automatic controlling device, operating an American Well Works submerged centrifugal pump with 3-inch suction and 3-inch discharge. The lift is 11.62 ft. The cost of the station complete was $922. This plant between January 20th and February 20th pumped a daily average of 510 gallons, only 20 people at present contributing sewage.

The third station was planned to take care of a large tract of land which is separated from the city by a creek and lies so low that an 18-ft. lift is necessary. Plans were made for a future population of 10,520 people on this tract. The reservoir is rectangular, 8 by 12 by 20 ft. The walls are of the steel reinforced type. The roof is a concrete slab 8 inches thick and reinforced with half-inch square bars placed 1½ inches above the bottom of the slab. The pumping plant consists of a 5 h.p., 60 cycle, 3-phase, 900 r.p.m. Lincoln motor, operating a 400 g.p.m. American Well Works submerged centrifugal pump, vertical shaft type, having a 4-inch suction and a 4-inch discharge. A vertical screen with two-inch mesh made of No. 6 galvanized iron wire on a substantial iron frame is set in a 6-inch partition wall that separates the pump wells from the main part of the reservoir. The pump wells are 3.66 by 4 by 6 ft. Connection is made with the creek so that it will be possible at any time to thoroughly flush the reservoir with creek water. The total cost of this station was $2,775.

At the present time this station receives the sewage from one residence and all of the factory waste and sewage of several factories and offices. The total amount averages 42,000 gallons a day, requiring the pump to operate less than two hours a day.

LINCOLN'S LIGHTING DEPARTMENT

Current Furnished for Street and Domestic Lighting —Incandescent Lamps Replace Carbon Arcs— Cost of Street Lighting Reduced.

Current for street lighting and for a certain amount of commercial use is furnished by the municipal lighting department in Lincoln, Nebr. For six or seven years, current was furnished for street lighting only, but beginning with October 15, 1913, the department was authorized to sell current and by the end of last year had 1,650 consumers. Current is generated at a central station at which there are four generating units, 250 k.v.a., 500 k.v.a., 750 k.v.a., and 350 k.v.a., respectively, each 4,400-volt, 3-phase. Nine 7.5 ampere series arc circuits serve 541 street lamps, one 3-phase circuit serves 302 cluster poles, and three primary circuits, 3-phase, are used for incandescent lights.

The department makes a most commendable effort to keep its equipment up-to-date in order to maintain high efficiency. In the report for 1917, the superintendent says: "Some very rapid improvements have been made in the electrical industry, so that one must keep pace with the new appliances used in order to reduce the cost of production. In the past year the lighting department has abandoned practically all of the old light arc lamps, which burned carbons and had continually to be replaced. The new type incandescent lamp which we now use has proved very satisfactory. They not only give a more steady and stronger light, but where we formerly had 50 lights on a circuit we now have 100 lights, with no greater consumption of current. Before we installed the new incandescent lamps, all our circuits had been over-loaded, and the only way to increase the number of lamps would have been to build new circuits direct from the station at a large expense. This installation not only enabled us to put out more street lights, but has reduced the k.w. consumption on the street circuits."

The new lights installed are type C-600 c.p. street series lights.

"Notwithstanding the unusual conditions existing at the present time on account of the war, prices of coal and material all having increased considerably, the operating costs are very favorable. The average cost for each street light has been reduced from $28.16 to $23.90 per year. The increased cost per pole on the down-town ornamental lighting system from $17.80 to $27.80 per pole per year is due to the great amount of repairs required on this system. This system was originally installed using only rubber-covered wire in the conduits, which should have been lead-incased. This was at that time brought to the attention of the council, but the contention then made was that the cost was prohibitive and, should the rubber-covered wire wear out, it could be replaced with the lead-incased cable when such parts became defective. In the past year we have had very much trouble with various sections at some places, showing the rubber worn and grounding on the conduit; at other places water got into the conduit and short-circuited the line."

More than one-half of the current generated is used for operating the water works pumping plants. The water and light services are both operated by the same department and under one head. During the year 1,960,348 k.w. were used for pumping and 1,549,532 for lighting. The net cost at the switch-board was $24,901.27, of which the largest items were coal (including cost of unloading), $16,068.19, and $8,947.78 for station salaries; the other items including oil, waste, repairs, insurance, and station expenses. The net cost per k.w. on the switch-board was 1.641c. The report also gives a statement by which to calculate the cost for comparison with the cost to private corporations, this including 4½ per cent interest on the bonded debt, 4½ per cent interest on the balance of the investment, 5 per cent depreciation, 5 per cent sinking fund to retire the bonds, and city and county taxes. These add to the net cost 0.57c per k.w. Including also the other costs beyond the switch-board, the cost per k.w. for the arc system was 2.65c, for the cluster system, 2.62c, and for the incandescent system, 2.35c.

LAYING CONCRETE PAVEMENT IN FREEZING WEATHER

Method Employed Successfully Last Winter at Fort Oglethorpe—Thawing Sub-grade—Warming at Night with Lanterns under Canvas.

In discussing the subject of concrete pavements at the convention of the American Road Builders Association, A. B. Dunning, chief engineer of construction, Quartermaster's Department, U. S. Army, described a method employed by him in laying a concrete pavement when the temperature fell below freezing at night. His description was as follows:

I desire to relate my experience on a concrete road which is now in process of construction for the War Department, at Fort Oglethorpe, Georgia. The grading of the road and the placing of concrete started about the first of last November, the sub-grade being the bed of an old chert road, very firm and hard. During the month of November the thermometer ranged from 50 to 87 degrees. In December it dropped to as low as 9 degrees above zero, consequently the finished work had to be protected from the various changes of temperature. This was done by placing "horses" across the pavement, upon which canvas was spread, and kept thus covered until the concrete had set sufficiently to allow the spreading of manure or straw over it, thus protecting the same from the extreme high temperatures. This worked all right until about the 7th of December, when a cold wave came, and the temperature became so low during the day time that it was impossible to do any work.

I never was in favor of laying concrete in freezing weather, especially upon concrete roads.

I want to make a distinction between laying mass concrete and laying concrete for pavements. When the work is so concentrated one might be able to handle the materials in such a way as to lay concrete in freezing weather, but so far as a concrete pavement is concerned, where the work is distributed over an extended area, for my part I am going to keep just as far away from freezing weather as possible.

On the 20th of December we resumed work with the thermometer ranging from 20 to 64 degrees during the day time, but during the night it dropped to freezing and lower.

The temperatures mentioned above are from the beginning of the work each day until the close. The temperature fell far below this during the night, causing freezing weather, but at no time was the work allowed to proceed until the temperature was above freezing, and it was suspended before reaching the freezing point each day.

But how to protect the work which had been laid, and what to do with the frozen material and sub-grade next morning?

A new feature to us was adopted in thawing out the sub-grade and material. This was done by covering the space with canvas, and connecting a pipe with the boiler of the mixer, and forcing steam under the canvas. This worked all right.

But protecting the newly laid concrete from the low temperature during the night was another question. We finally succeeded in the following manner: At the suspension of work for the day, or rather up to the time that the temperature had reached about the freezing point, "horses" were placed across the newly-laid concrete about 8 feet apart, said "horses" being about one and one half feet above the concrete. Upon the horses was spread canvas, thoroughly anchored on both sides and ends, and lighted lanterns were placed underneath this canvas at a distance of about eight or ten feet apart. This was done by locating them on the forms protecting the side of the concrete, or hanging them to the "horses." This brought the temperature up to 50, under the canvas while on the outside it ranged from freezing to as low as 9 degrees.

This proved a complete success, so that during all the cold weather we had in the month of December, when we laid the concrete in the day time when it was above freezing, we did not lose one cubic foot of concrete on account of the freezing temperature at night, the temperature having dropped as low as nine degrees above zero.

We thus continued until the 28th of December, when snow and colder weather caused us to suspend the work, and it has been practically suspended until the present time.

The lantern feature was suggested by one who, when living in a northern climate, had placed a lighted lantern under the Buffalo robe when sleigh riding.

DULUTH WATER AND LIGHT DEPARTMENT

Freezing of Water and Gas Mains—High Prices Increase Cost—No Extensions on Ungraded Streets—Assessing Extension Costs.

The water and lighting services of Duluth, Minn., are operated by one department, under the charge of the commissioner of public utilities, P. G. Phillips, the same officers having charge of all departments of both services except the engineer in charge of the pumping works and the engineer in charge of the gas works.

The report for the year 1917 shows a considerable increase in expenses of the department over previous years. The operating expenses of the water service, for instance, were increased more than $17,000, but a considerable part of this was due to the large number of frozen services. During January, February, March and April of last year, over 1,200 services and 25 or 35 water mains were frozen, necessitating the use at one time of three electric thawing machines and two steam boilers. The same unusual difficulty was found with the gas mains also, which were obstructed by water getting into them and freezing. The latter trouble apparently was due not to moisture carried over with the gas but to outside water getting into gas pipes and freezing the pipes solid where they were surrounded by frost. For this reason the curious condition existed that, whereas the water mains froze most generally where they were too near the surface, the gas mains gave most trouble where they were deep, being as low as and sometimes lower than the water pipes, the leakage from the water mains apparently entering leaky joints in the gas mains. Gas pipes that were shallow or were laid on the surface of the ground gave no trouble. An over-land high-pressure gas pipe, which for over one-third of a mile is laid on the surface without any covering whatever, gave no trouble from freezing.

In addition to these unusual troubles, however, there was considerable increase in cost due to the general advance in prices. The increases in wages during the year amounted to nearly 20 per cent. Cast iron pipe cost nearly 70 per cent more than in the previous year, brass goods about 10 per cent, and coal, 133 per cent. While the gross revenues from water showed a total increase of $11,000, the net revenues showed a decrease of $16,000 from the previous year; while the gross increase in gas revenue of nearly $30,000 was reduced to $2,700 by the increased costs. It would seem probable that the gas business will show an improvement this year. The city does not manufacture its own gas, but purchases it from the Zenith Furnace Co., and last year made a new contract with the company by which the cost to the department of gas for general purposes was reduced from 40c to 37½c and that of gas for house heating purposes from 37½c to 32½c per thousand cubic feet.

At the end of 1916, 90.2 per cent of the consumers were on meters, the balance being flat rate customers; while last year, the percentage of metered services had increased to 93.2 per cent, and the total number of flat rate consumers was 847 as compared with 1,117 the previous year. All new customers are being served with meters and the old ones on the flat rate are permitted to exist only where there is difficulty in installing meters that will be safe from freezing and where no connection has been made to the sewer and there is no private drain that would permit water to waste in order to prevent freezing or for the purpose of cooling or refrigerating.

Owing to the increased cost of making extensions of mains, and especially to future trouble stored up by laying mains in streets where grades have not been established, it was decided that no extensions would be made on ungraded streets or where there were less than six houses to the block. "It does not seem practicable to make these extensions in all cases where requested unless there is a real existing demand for the service, and unless it can be made at a reasonable cost and without too much of a burden upon the department. It must be borne in mind that the present assessment of 8 per cent of the cost of each extension against the abutting property does not make the extension self-sustaining to the department in its fullest sense. In addition to the interest upon the investment, the depreciation and sinking funds necessarily must be provided for as well as the maintenance of the mains and repairs on account of leakages and breaks. There is also the additional operating cost where extensions are made on the outskirts of the system, on account of the increased distance which it is necessary to convey the water, which in some portions of the city requires the water to be pumped three times in order to reach the consumer, who is charged one price identical with charges to all other consumers regardless of their location. Neither does this charge cover additional expense necessary to increase the main plant, pipes, reservoirs and pumps, to convey both water and gas from their source of supply through the main plant to the distant consumer."

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Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

THE FUNCTIONS OF A CITY ENGINEER.

Our attention has been called to a proposed change in the organization of those departments and officials of a certain New England city that are concerned in the engineering work of the city, and especially that important branch of it that has to do with the city streets and paving. There appear to be two departments in the city known as the engineering department and the highway department, and it is proposed to abolish the former and place all engineering work of the town under the charge of a superintendent of streets.

On another page a quotation is given from a report upon a plan for the reorganization of the Public Works Department of Indianapolis, in which the Bureau of Municipal Research recommends that the street commissioner's department be abolished and its functions be absorbed in the city engineer's department. Here we have the exact reverse of the change proposed in the Massachusetts town, and the question naturally arises as to which is preferable. The report just referred to gives excellent reasons for a combination of the two classes of functions under one head, and we may assume that such combination is desirable. But the idea of making the city engineer a subordinate of the superintendent of streets can only, it would seem to us, result from the opinion (that is even yet too commonly entertained) that engineering is merely a matter of giving line and grade and measuring work. It is unfortunate that there is not a more general realization of the importance of the designing and planning of work by engineers—that this is by far the most important work performed by engineers and that requiring the most skill, that it can effect great saving in cost and great increase in effectiveness of the work done, and that the non-technical man is even less capable of performing such work than of using surveying instruments.

In the case referred to, the committee recommending the change apparently had a very indefinite idea as to what the duties of even a superintendent of streets are, since, in giving an extensive list of such duties, they included only the keeping of records of money expended and work done, of teams and men employed and materials used, and the preserving and indexing of plans and documents connected with the engineering work. Not a word about planning work, or even of supervising construction. To carry out the ideas which they apparently had in mind, the duties of superintendent of streets could be performed by one who had had a little experience as time-keeper for a contractor, while the "engineering" could be performed by a young man who had had a few months' experience in the use of transit, level and steel tape. The real engineering will probably be confined to decisions made by the selectmen and the tax-payers along the streets. If this scheme goes through, it will be interesting a few years from now to visit this town and learn to what degree of dilapidation and disrepair the several streets, sewers and other public works have degenerated under this amateur supervision.

OIL EMBARGO THREATENS DESTRUCTION OF ROADS WORTH TENS OF MILLIONS.

A few days ago we received from Wm. D. Sohier, chairman of the Massachusetts Highway Commission, a letter in which he called attention most emphatically to the danger that is threatening many of the highways of the country because of an embargo put upon the transportation of road oils. Understanding that embargoes had been placed which would prevent the shipment of asphaltic road oils by rail or the transportation of crude oil by boat, Col. Sohier says:

> If that ruling is continued in force, we shall lose in this state and many others thousands of miles of good macadam road that can only be maintained with bituminous surface treatments and bituminous patching. Everyone knows that since motors have come in you cannot maintain macadam or gravel even for a few months without the use of some bitumen. The same is true in England and France. England is using more tar than ever since the war began. She cannot get the asphalts, but she has over 40,000 miles of road treated with tar surface applications, and several thousand miles built of bituminous concrete.
>
> I cannot conceive today of anything more important than the main highways; and the older ones, if not built of concrete, bituminous macadam or like pavement, cannot be maintained or even properly patched without the use of some bitumen.
>
> Think how short-sighted it is! We plan to use asphalts because it takes only 3 or 4 car-loads to the mile of road—less for surface treatments. This enables us to use poorer local materials. If we build cement concrete, we need 40 car-loads to the mile of road, or ten times as many cars. If we have to use imported stone, as we must in many places if we cannot secure bitumens, we shall need from 75 to 85 car-loads for each mile of road, or 20 times as many cars.
>
> We are building and maintaining several hundreds of miles with sand and asphaltic residuums. All the stone would have to be imported by rail for this whole section of the state. In a number of other sections we can use gravel or local stone if we can get the bitumens; otherwise we must import stone.
>
> If we cannot get these bitumens and get them early, it is certain, I think, that at least 600 miles of state highways, and many times as many miles of improved county and town ways on improved main routes, will be destroyed before fall. Millions of dollars will be lost in this state alone. The main roads will become impassable in many places. They will have to be entirely rebuilt, and they cannot be in these times at less than $30,000 to $40,000 a mile, even if you could secure the labor and materials.
>
> In some cases, all the road requires is a few barrels of

> oil or tar for slight patching. In other cases, one tank car will provide enough for two to three miles of surface treatment. Three or four tank-cars or four box-cars will provide enough bituminous material to construct or reconstruct a mile of bituminous macadam or bituminous gravel or sand road.
>
> It will be disastrous if we cannot get bitumens. Think of the thousands of miles of road destroyed, dust everywhere ruining crops and fruits, and the millions upon millions of dollars required next year to rebuild the roads. I think some states would lose as much as or more than Massachusetts.

There was consternation last year when an embargo was put upon the hauling of stone and sand by rail, but that upon bituminous materials would appear to be even more serious. There are few sections of any state where stone or sand of at least reasonably good quality cannot be obtained within 50 to 100 miles, and for this distance the material can be hauled by truck if necessary, although the expense would generally be greater than by rail transportation. But the great majority of roads, and especially those carrying the heaviest traffic, are a thousand or more miles from the nearest source of bituminous materials, and motor transportation over such a distance is impracticable. It is rail transportation or nothing.

This being the case, there would seem to be only two alternatives—to improve and repair roads with materials not requiring bituminous binders, or to allow them to be worn out to the point where they become useless and then practically abandon them until the embargo is lifted. As Col. Sohier has shown, the former, even from the immediate viewpoint of transportation only, would be saving at the spigot to waste at the bunghole, since the construction or repair of any kind of water-bound broken stone road would require from 5 to 40 times as much freight-hauling as would be necessary where bituminous materials are used. Nor is any relief offered by the use of materials other than broken stone, except in a few sections of the country. For instance, outside of trucking distance of the region where paving brick is manufactured, the construction of a brick pavement on a concrete base would require rail hauling of more tons of material than would be required for a macadam road; and the same is true of stone block or wood block.

As to the other alternative, of allowing the roads to be worn out, this would mean the rapid elimination of practically all motor trucking, and with it such aid as this gives and is hoped to give increasingly to railroad traffic. If no bituminous material is to be available for repairing and resurfacing and if the use of the main highways is to be intensified to the extent that is now anticipated, before the end of the present season is even within sight we may expect to find many if not most of the highways full of holes and raveled areas which will not only interfere with and slow down all motor traffic, but will unquestionably result in a more or less rapid deterioration of the trucks and discouraging of their use.

Transportation is the vital problem in this country at the present time. The papers warn us that the coal transportation problem is by no means solved, although the passing of cold weather has caused it to receive less attention from the average citizen. Alarming reports are being made public concerning backwardness in the production of air-craft and other war necessities and a large part of this is attributed to deficiency in transportation facilities. It will be of little avail for the farmers to grow bumper crops, for the lumber men in the northwest to cut cedar for air-planes, for the miners to produce coal and for industries everywhere to surpass all previous records of production, if it is going to be impossible to get their products to points where they are needed.

Of importance also to highway officials, and especially to city paving departments, is the fact that the government has requisitioned all tank steamers used for carrying oil from the asphalt fields in Mexico and other southern countries, and has requested that refining of asphalt cease for the present. It is reported that there are 400 miles of asphalt streets in Brooklyn, N. Y., for example, which need immediate repairs after a long and trying winter, but that there is a supply of asphalt on hand sufficient to keep the repair work going for only two weeks. If these repairs are not made, the condition of many of the streets will rapidly become such as to interfere seriously with the transportation of all kinds of materials, including many thousands of tons which are more or less vitally important to the war program and the feeding of the nation. There are thousands of miles of asphalt pavements in our cities that need to be repaired every year, and it is a serious question what the outcome will be if it should be impossible to obtain asphaltic materials from either the southern or western fields with which to make such repairs. It is of the greatest importance that the commissions charged with the regulation of water and rail traffic give adequate consideration to the highway traffic also and to the importance of providing means for keeping up the routes over which it must pass.

PRACTICAL MUNICIPAL SANITATION.

Never before this war time has the public been given so much advice as to what it is its duty to do in connection with matters which are of public concern and not to the commercial advantage of the advisor. Most of this, of course, is connected with the conservation of food, financing the government, and other features of the war program. Possibly this, like other lessons of the war (it is to be hoped), will have a permanent influence and be applied to advantage under peace conditions. One suggestion that encourages this hope comes to us from Louisiana. In a local paper we find Mayor E. M. Bodenheimer, of South Highlands, giving excellent advice in a display notice which must attract the attention of every reader of the paper. This notice begins:

ATTENTION! RESIDENTS OF SOUTH HIGHLANDS.

The village authorities of South Highland take this opportunity of reminding its residents that now is the time of the year to pay particular attention to the following:

> See that your cisterns are well cleaned.
>
> That your ice-boxes do not drain under the house and form pools for mosquitoes to breed in.
>
> See that your gutters all drain well; clogged-up gutters furnish a liberal supply of mosquitoes.
>
> That there are no pans or receptacles with standing water in them on your premises.
>
> That your chicken yards and cow lots are thoroughly cleaned and kept clean. Don't give the fly a place in which to breed.
>
> That your garbage cans have tight-fitting tops, thereby eliminating the chances of the fly.
>
> That your chickens are kept up and do not spoil your neighbors' gardens.
>
> All of the above requirements are fully covered by village ordinances.

These are most practical recommendations. If the mayor and village officials are as earnest in eliminating all mosquito-breeding places that are under their control, and in enforcing the ordinances covered by these recommendations, as the mayor is in getting these excellent suggestions before the citizens, South Highland should reap the benefits in a freedom from malaria and from mosquitoes which will give it a high standing among the municipalities of that state.

The WEEK'S NEWS

State Highway Developments in Montana and Texas—Suppression of Venereal Diseases in Oklahoma—U. S. Public Health Service Safeguarding Milk Supplies in Areas of Federal Interest—Water Meters No Longer Compulsory in Salt Lake City—Philadelphia Water Works Strained by Demands—Boston Gets Lower Street Lighting Rates—Mobile Firemen Strike—Government Asks Philadelphia to Stop Non-Essential Improvements—Chicago's Rapid Transit Projects.

ROADS AND PAVEMENTS

State Department Bridge Standardization Saves Money.

Helena, Mont.—The standardization of bridges and bridge designs, which has been undertaken by the state highway commission, has resulted already in considerable saving. A start on this was made by the former commission and the work is being carried forward by the present body. Under the old system the bridge companies prepared their own designs and the commissions had no satisfactory basis upon which to compare bids since the designs were not uniform in strength nor in cost. The bridge department was organized and technical men were employed so that county commissioners at all times could have disinterested expert advice. From the time of its organization in May until November the bridge department designed and supervised structures of an aggregate cost of $225,000. Four bridges cost over $25,000, two from $10,000 to $20,000, 15 from $5,000 to $10,000, and 17 $5,000 and under. The department estimates that this standardization of bridges has saved Montana taxpayers thousands of dollars. Standardization in road work has also been a feature of the commission's activities. It held two conferences last summer with county commissioners, surveyors and road builders. These served to establish a better acquaintance among the road builders of the state, acted as a clearing house of ideas and made a start toward standardization of means and methods. It enabled the commission to get into touch with men needed for the prosecution of the work planned. From among those present a number have become directly associated with the commission. Many of these are either county commissioners or county surveyors in charge of work and not in position to give their undivided time to the work of the commission, so they have been engaged on a per diem basis to give such time as their positions permit in acting in a consulting and advisory capacity in the district where they reside.

Amend Motor Vehicle Tax and Highway Law.

Austin, Texas.—The House has finally passed by a vote of 108 to 7, making the emergency clause effective, the Tillotson-Blank bill defining commercial motor vehicles and fixing a scale of highway taxes upon them. The bill also empowers the state highway department to build as much as ten miles of improved roads in any county during a given year, instead of two and one-half miles as in the present law; in other words, if the county builds thirty miles, the state may put up money for an additional ten miles. Under the construction of the present law, it has been held that a commercial vehicle is one carrying either freight or passengers for hire, as the law reads, "carrying passengers or freight for hire." The new bill changes that phrase to define a commercial vehicle as one carrying "passengers for hire or freight," so all trucks will come under the terms of the statute. As finally passed the bill carries an amendment to provide that automobile taxes shall be computed upon a quarterly basis rather than semi-annually; that is, when a citizen buys a new car after October 1 he will have to pay taxes only for one-quarter of that year instead of one-half. The scale of taxes for privately owned passenger automobiles remains as at present, the House having refused amendments offered to reduce the rate from 35c. to 30c. or 25c. per horse power. If the new bill is finally enacted rent cars or service cars for carrying passengers will be taxed $15 a year for capacity of three passengers, $25 a year for five passengers, and $35 a year for seven passengers. Freight automobiles, either for private business or for rent service, will be taxed as follows, Mr. Tillotson explaining that the purpose is to levy rates according to probable damage to roadways: Up to carrying capacity of 500 pounds per wheel, or 2,000 pounds to the car, $10; up to 750 pounds, $15; up to 1,000 pounds, $20; up to 2,000 pounds, $30; up to 4,000 pounds, $40; up to 6,000 pounds, $60; up to 8,000 pounds, $150; up to 10,000 pounds, $300. For each 1,000 pounds above 10,000 pounds carrying capacity per wheel, or fraction thereof, $50.

Reorganization of Paving Control.

Cleveland, O.—In direct line with the establishment by the city of a division of underground improvements, to avoid unnecessary pavement destruction, a general program of paving systematization is to be inaugurated, according to an announcement by mayor Davis. As one of the steps in this direction, direct supervision of all pavement repairs, now handled entirely by the division of streets, is to be undertaken by the city engineer, who controls the city's other paving activities. The mayor gave his approval to a plan outlined by city engineer Robert Hoffman, which provides for the systematic repaving of the city streets so as to obtain as early as possible well paved streets leading from the heart of the city out into every important section. By having the division of engineering assume supervisory control of the repair work, such conditions will be prevented as the making of extensive repairs on thoroughfares about to be repaved, or for which other improvements, such as sewers, grade crossings or other underground work are projected.

SEWERAGE AND SANITATION

Typhoid Epidemic Probably Caused by Water.

Dubuque, Ia.—Dr. Hamilton, epidemiologist of the state board of health, has submitted a verbal report of the result of his investigation into the unusual number of cases of typhoid fever which have occurred here during the past several weeks. While Dr. Hamilton was not willing to say that the water was the cause, he intimated that this was his belief, declaring that many cases had developed during January, when the waterworks had been pumping river water through its mains. Dr. Hamilton praised the efforts of the local board of health in fighting the disease.

Oklahoma Fighting Venereal Diseases.

Oklahoma City, Okla.—For some time the state board of health under commissioner John W. Duke has been conducting a campaign on social hygiene, designed to combat venereal diseases in Oklahoma. To a large extent this campaign has been educational. The time has now come, the board feels, when more active measures must be taken without delay. The state board has far-reaching powers in this respect and will not hesitate to make use of them, following the special appeal which has been made by the United States government for action which will protect our soldiers from the danger of venereal diseases. The first work will be done with local communities, especially cities of fairly good size and situated near enough to a camp so that soldiers visit them when they have a furlough of a day or more. The board says: "There is not the slightest excuse for the existence of a segregated district in any Oklahoma city. In addition much of the scattered vice can be put down by vigorous action on the part of the local authorities. Every community which is visited by soldiers should pass ordinances providing for the detention and treatment of every person infected with venereal disease. In addition the state board of health has passed a regulation making such diseases reportable by physicians, the same as smallpox, diphtheria and other recognized infectious diseases are. It is not necessary that sufferers from such diseases be reported by name; it can be done by initials or number. If, however, those needing treatment refuse to take it their names will be given. Detention hospitals for the treatment of infected persons will be established as needed. This already has been done with success at Lawton, where a number of women are interned for treatment. This is not done as a punishment. It is for the benefit of the person infected, as well as for the protection of the community. Dispensaries for the treatment of disease will be established. A very large number of placards calling attention to the dangers of venereal diseases have been distributed throughout the state by the board."

Safeguarding Milk Supply in War Work Areas.

Washington, D. C.—With the object of safeguarding the milk supply for workers in shipbuilding plants and other war industries and in military cantonments the U. S. public health service of the treasury department has begun consideration of the feasibility of the construction of pasteurizing plants in the vicinity of these sites. Sanitary experience, according to an official statement, is showing that the combination of a sanitary water supply and universal pasteurization of milk supplies and milk products is proportionately far more effective in preventing typhoid fever and other food and water-borne diseases than either of these measures used singly.

"Treatment" of Indigent Sick.

Toledo, O.—Joseph Kelsey, director of the division of health, in his recent annual report to the city council, says it is cheaper to pay railroad fare for sick and indigent to other cities than it is to take care of them. He says: "The matter of furnishing transportation to indigent poor when they are sick is one of the most important factors in cutting down the expense of caring for our sick. It is much cheaper to transport an injured or sick hobo to Chicago, Columbus, Cleveland, St. Louis, Pittsburgh, or intermediate points, than to keep him or her here for one, two or three months and then ask the county to bury them. I have had cases this year that I could have saved the city $50 to $100 on, had I had the authority to transport such patients to their destination while going was good, for if one waits until they can only be transported on a cot, it is then too late to cut down expensive hospital nursing."

WATER SUPPLY

Water Meters Not Compulsory.

Salt Lake City, Utah.—An amendment eliminating the provision of the city water ordinance requiring compulsory metering of new premises has been passed by the city commission. This means that no longer will owners of new buildings be required to install meters. Under the new ordinance water users are given the option of paying for their water on a flat rate or on a meter rate. Before the election of C. C. Neslen as commissioner of waterworks and prior to the passage of the amendment today, erectors of new buildings were required to install meters and were not allowed the option of the flat rate. The compulsory metering provision has been the source of much protest and dissension from property owners, who preferred the flat rate system. The ordinance passed also includes a provision aimed toward the beautifying of the city. The measure provides that meter rate credit will not be allowed for parking space in front of premises which is not properly cared for. Under the old ordinance the water used on the parking space between the sidewalk and curbing in front of meter using premises has been charged to the meter and later rebated by the city. This money will not hereafter be refunded unless the parking is maintained in proper condition. Incident to the passing of the ordinance the waterworks department announced that hereafter no installation of meters will be allowed by plumbers. The work after this must be done by plumbers employed by the waterworks department. This ruling is expected materially to decrease the cost of installation to property owners, as the department has established a fixed rate of $2 for installation of meters in basements.

Boroughs Win Long Water Rate Fight.

Bellevue, Pa.—The supreme court decision reversing the superior court and upholding the public service commission in the Ohio valley water company case is considered a big victory for the north boroughs interested in the case, which was hard fought and of long duration. The municipalities interested in the case are Bellevue, West View, Avalon, Ben Avon, Emsworth and McKees Rocks boroughs and Neville and Stowe townships. The present charge for water is 40 cents for 1,000 gallons. The rate was set aside as excessive by the public service commission, which reduced the charge to 12 cents per 1,000 gallons, with a fixed charge to each consumer of $6 a year. In addition, each borough was assessed a sum toward maintenance of the company's property in return for use of water for fire protection. The new rate fixed by the commission was to have become effective last year, but was suspended pending final disposition of the case. It is thought probable the water company will have to rebate consumers for the difference between the new and the old rate for the period of suspension.

Demand Strains Philadelphia Water Works.

Philadelphia, Pa.—Philadelphia's water works are being operated beyond the safety point and the pumps and other machinery are in constant danger of breaking down under the strain. The demand for water is far in excess of the capacity of the water system, and unless plans for adequate relief are begun at once a serious situation may soon confront the city. These facts are brought out in a report by Carleton E. Davis, chief of the bureau of water. Chief Davis gave figures to show that, while the city has greatly increased in population and the water requirements grown out of all proportion because of the establishment of new shipyards and munition plants and the enlargement of other industries, absolutely no provisions have been made or are under contemplation by the city for its future water needs. Chief Davis has for several years advocated the immediate construction of additional pumping stations, filter beds, reservoirs and an express service of two large mains from Torresdale to the business section of the city, but despite numerous serious breaks in the mains, due to the increased pressure needed to supply the demands, councils has never given the matter serious consideration. At least five years will be required, according to chief Davis, to bring the water system to the city's needs. Had the work been commenced when the need of the project was first felt, he said it would have been completed before the big advent of high prices for materials and labor. A statement issued by director of public works Datesman follows: "It is pointed out by chief Davis that at the present time the waterworks are being operated to a point beyond safe capacity, and he explains that the demand is greater than the supply. It is his thought that, inasmuch as the demand is so great and the operation of the works so profitable to the city, it would not only be good judgment, but good business to engage in a program of preparedness by way of improving the system and make such repairs as are necessary. He feels that money invested now for such purposes would—it is evident from the returns for 1917—be most profitable and result in bigger earnings after the improvements are made. As a simple business proposition it has been suggested that the water bureau should be financed with sufficient elasticity to permit it to meet the demands of increased business as readily as any recognized public service corporation. According to the report, the waterworks earned a net profit in 1917 of $1,500,000, equivalent to a dividend of a little more than 2 per cent on the investment. The waterworks as operated, represent an expenditure of approximately $68,000,000. The profit as specified is the balance remaining in the city treasury from the operation of the works after all operating and maintenance expenditures are paid and after $1,283,000 has been set aside for depreciation. The statement of the accounts of the operation of the water works includes $67,000 for operation and maintenance of the high-pressure fire system. Chief Davis pointed out that in a strictly accounting sense this sum of $67,000 may not be a correct charge against the waterworks proper, but is included in order that the statement may be thoroughly conservative. As a matter of fact, this is a small charge as compared with the approximately $500,000 worth of free service which is rendered each year by the water bureau, for which no credit is given on the books of the controller or claimed in the statement of the bureau of water." The income for the year 1917 was $5,603,928.79 and the expenses $4,083,829.51.

New Rates to Meet Higher Costs.

Mansfield, O.—Water rates have been raised, according to an announcement by C. H. Stander, city service director. The new rate became effective April 1. When council last year authorized the issuance of bonds to provide meters for all water it failed to foresee that expenses would be incurred in keeping the meters in repair. At present a force of men is continually at work repairing and adjusting meters. That is an item in itself that means considerable expenditure. Last year's receipts from water rentals were $61,000, while the estimate for running expenses this year is $74,000. This does not include extensions which must be made to keep with constantly increased home building in new sections of the city. The scale of water rates, which became effective on the first of this month, are now: 1,500 cubic feet or less in six months, $3; next 13,500 cubic feet in six months, 20 cents per 100 cubic feet; next 30,000 cubic feet, 15 cents per 100 cubic feet; next 60,000 cubic feet, 10 cents per 100 cubic feet; next 120,000 cubic feet, 8 cents per 100 cubic feet. In addition a change will be made in the method of payments of water bills. In the future bills in the first and second wards will be payable April 1 and October 1, while those in the third and fourth wards will be due January 1 and July 1.

STREET LIGHTING AND POWER

Franchises of Merged Competing Companies.

Lockport, N. Y.—The state public service commission for the second district has handed down a decision affecting the Lockport Light, Heat & Power Company. It has decided that when a city grants franchises to two different corporations enabling them to compete for the electric light and power business in the community, and the companies are later merged, the city cannot fairly insist that the owners of the property which was installed for the benefit of the people of the city shall not be allowed to earn a fair return upon the value of all the property employed in the public service. The fact that there may be a duplication of property, the commission says, is due to the situation which was created by the city when it granted two franchises to two separate corporations, and the owners of the properties must be allowed a reasonable opportunity to work out of the difficulty. Another interesting point taken up concerns the necessity of a steam reserve station. The decision says: "It is a well-known fact that a concern like the Lockport company cannot always be assured that it will have a never-failing supply of hydroelectric power, even though it does come from the mighty falls of Niagara. Delays and interruptions are a necessary incident to the business of transmitting electric energy from the source of supply to the point of distribution over long transmission lines; they are in most instances inevitable. When this happens, all the industries dependent upon this power are subject to serious loss and inconvenience, even if the interruption in the service is only of brief duration. There is hardly an electric light and power company of any consequence in the state purchasing hydroelectric energy for distribution which has not some sort of steam reserve to back it up for the purpose of taking care of interruptions as well as to cut down the peak, inasmuch as hydroelectric power is usually sold on the basis of the peak-load demand. It may be that the steam plant will not be called on for weeks at a time to supply electricity because of the failure of the hydroelectric energy, but when it is needed it is there ready for use, and it enables the company to continue to supply its customers and reduce losses which might otherwise result."

Municipal Plant Raises Rates.

Green River, Utah.—Permission to increase its rates from 10 cents to 12½ cents a kilowatt hour has been granted by the public utilities commission to the municipal light plant of Green River. The increase is estimated to add about $1,000 a year to the revenues from the plant. The plant develops about six times as much power as it sells, and H. H. Blood, member of the commission who presided at the recent hearings on the increase question, urged on the city of Green River adopting a policy under which the surplus power may be used for irrigation of territory near the town which is said to have suffered from lack of water for crops. Mr. Blood said he believed some such action would be taken and that with the increased rate the plant would pay for its own operation and maintenance and leave a surplus for depreciation.

Big Street-Lighting Rate Reduction for Boston.

Boston, Mass.—The Massachusetts Gas and Electric Light Commission has ordered important and substantial reductions in the rates for lighting the streets charged the city by the Edison Electric Company. This well-known arbitration case has lasted more than three years, producing over 10,000 pages of testimony and more than 360 tables and exhibits. It is calculated that the reductions established will save the city about $600,000 during the life of the contract arbitrated from November 6, 1914, to November 6, 1924. The case was brought about as a result of the agreement between the city and the company, which requested the board to investigate and decide whether the street-lighting rates are as a whole fair, taking into account length of time, discount and other considerations. Under the agreement the commission had no authority to interfere with the contract rates unless it determined that a fair price for the entire service supplied to the city is less than the total amounts to be paid according to the schedule. Therefore the question was whether a fair price for the entire service was less than these amounts. The agreement authorized the board in that event to reduce one or more of the rates charged, substituting such rates from the beginning of the agreement for the corresponding rates in Schedule E. The schedule prices per lamp per year and the amounts awarded are as follows:

	Schedule	Board Price
Magnetite arc, 800-cp.	$87.530	$79.60
40-cp. incandescent	18.333	15.92
60-cp. incandescent	21.136	17.69
80-cp. incandescent	29.310	22.94
100-cp. incandescent	33.426	29.98

On the agreement date there were 4.543 magnetic arcs, twenty-four flaming acrs and 4.083 incandescent lamps of 40-cp. to 400-cp. rating, 2,910 being of 40-cp. size. Lamps and equipment were supplied by the company at its expense, save certain former gas-lamp posts owned by the city and later used for electric lighting. The agreement provides for extensions of service, relocations of lamps and substitutions of other type lamps, but upon terms designed not to increase thereby the relative cost to the company of supplying service and to compensate the city for any reduction in such cost. Also, the number of lamps of any type required by the city shall not at any time during the agreement, save as streets may be discontinued, be less than 95 per cent of the maximum number of such lamps in service at any time prior to the agreement.

The company computed a cost greatly in excess of the aggregate price for the service expressed in the contract, but the figures were made before close analysis of costs was undertaken in its behalf. The greatest differences in estimated costs of the property involved arose with respect to the distributing system and especially the underground installation.

The aggregate cost to the city of the lamps in service on the date of the agreement was $479,718.70 per year. The concrete question was whether or not this is a fair price for the entire service. The city conceded the soundness of basing the price upon cost, but re-examined all expense and property items exhibited by the company and challenged many. Comparative summaries follow:

	Company	City
Operating expenses	$314,013	$235,986
Taxes	60,503	42,096
Depreciation	42,000	34,622
Return	197,994	96,571
Total	$614,510	$409,275

The commission says: "A fair price for the entire service supplied the municipality must in any event take into account such exclusive costs both of investment and operation. But, when it comes to the investment and expenses common to the company's entire system and business, any assignment to the city of a definite share in each item depends primarily on the assumed necessity of making such assignment. . . . Had the company never lighted the streets of Boston there is little, if any, of its plant other than that devoted exclusively to the service with which it could or would have dispensed. Even while the case was pending the growth of the commercial business changed substantially the ratio of the city's demand to the company's peak—a ratio used repeatedly in determining and stating with 'illusive inexactness' items of investment and expense attributable to the city. Neither party sought to measure the fair price of the entire service by its cost if independently performed, and both parties recognized the community of interest alluded to in dealing with the generating and transmission expenses. The evidence disclosed hidden among the legal expenses of the company large payments made for the maintenance of lobbies at the state house and city hall. Aside from the exclusion of such items, in finding a fair and reasonable cost of the service, the board, in view of its public character and of the paramount duty of seeing that the companies under its supervision in the conduct of their business and the uses and devotion of their resources practice and maintain high civic standards, feels bound to condemn such expenditures as wholly unwarranted and inconsistent with such standards." Upon the whole, the commission finds that a fair price for the entire service supplied to the city is less than the total amounts to be paid according to Schedule E of the contract and is the sum of $437,000, and it therefore reduces the so-called running costs per lamp-hour in the following rates charged according to Schedule E, with respect to the following described lamps and with the resulting prices for 3,828 hours a year after deducting a discount of 10 per cent:

40-cp. series incandescent lamp from 0.25 to 0.18 cent.	$15.92
60-cp. series incandescent lamp from 0.30 to 0.20 cent.	17.69
80-cp. series incandescent lamp from 0.40 to 0.30 cent.	22.94
100-cp. series incandescent lamp from 0.50 to 0.40 cent.	29.98
800-cp. series magnetite 500-watt d.c. arc lamp 1.60 to 1.37 cent.	79.60

FIRE AND POLICE

Leather Factory Blaze Makes Quick Headway.

Detroit, Mich.—Bursting into full force within a few moments, fire in a brief but spectacular blaze destroyed the stock of leather goods and equipment of a harness and leather goods manufacturer and wrecked the four-story building occupied by the concern. The stock included, it is said, 24,000 sets of finished harness and saddlery for the United States army, and one feature of the blaze has given the police some basis for considering a theory of incendiarism. This feature was the big headway gained by the fire. All four floors were in full blaze when members of the Michigan state constabulary, on guard on the water front, ran to the scene. They found one end of the building a mass of flames. Timothy E. Callahan, assistant fire chief, said the blaze had gained such headway when the first apparatus arrived that awnings on buildings across the street had taken fire. Incidental to the unusual circumstances were alarms of fire, one from the west side and one from the east side. The explosion is believed to have been due to the blowing out of windows on one side, under pressure of smoke, heat and gasses. The total loss by fire, water and smoke will approach $500,000, it is believed. The rapidity with which the fire attained its great spread before being discovered may have been due in part to the fact that the floors of the building were more or less saturated with harness oils and oil in some quantities was kept in the building.

Police Pension Law Held Not Retroactive.

Trenton, N. J.—That the act of 1915, creating a policemen's and firemen's pension fund, has a prospective rather than a retroactive effect was the conclusion reached in an opinion filed in the supreme court upholding the commissioners of Trenton in dismissing a petition filed by Mrs. Kate V. Irving, who sought a pension because of the death of her husband, Charles, a patrolman for nine years. Irving died March 20, 1914, and the act was not approved until April 8, 1915. In deciding the case the supreme court said the only point involved was whether the act in question was to be given a prospective or retroactive effect. "There is nothing on its face to indicate," said the court, "that the legislature intended that it should be retroactive. It is the accepted law in this state that statutes are to be given prospective and not retroactive effect unless their language makes them retroactive and admits of no other construction."

Firemen Strike for Higher Pay.

Mobile, Ala.—With twenty members of the fire department on a strike demanding an increase in wages, Mobile was left without sufficient fire fighting forces to man its fire houses. One fire station was left entirely unmanned. City commissioner Crawford called for the soldiers doing duty on the water front to aid in the protection of property. Members of the police and street departments were asked to take the places of the striking firemen. The strike followed the refusal of the city to grant the firemen an increase of wages and the discharge by commissioner Crawford of Felix Wainwright, president of the firemen's union. The commissioner stated that the city was unable to meet the firemen's demands, asking for a salary increase from $65 to $90 per month. President Wainwright said that the union firemen would respond to calls only from government plants. The firemen's union was organized here about six months ago.

GOVERNMENT AND FINANCE

Government to Halt Unnecessary Improvements.

Philadelphia, Pa.—All work on municipal improvements in Philadelphia that are not necessary to the safety and health of the public will probably soon be stopped by the government for the duration of the war in order that labor, materials and credit so used may be diverted to the needs of the government. Contracts aggregating $92,000,000 will be involved in the order. Announcement to this effect was made following a conference attended by Richard L. Austin, of the federal reserve bank and chairman of a subcommittee of the capital issues committee of the treasury department; John M. Walton, city controller; John M. Connelly, city solicitor; director Twining, and Joseph Smith, secretary to the mayor. Mr. Austin was asked by secretary McAdoo to investigate every department of the city government to ascertain what public works can be held up until after the war, in accordance with an appeal made about a month ago that all non-essential public work be stopped for the duration of the war so that the government may have a wider field for obtaining labor, materials and credit. The principal work that is affected is the building of the subway loop and sections under the city hall, the Frankford elevated line and the Parkway. Director Twining was requested to prepare a report on the condition of the work of the transit lines, which will be submitted to Washington. No direct order or request for the stopping of the work was issued, only the intimation being made that such a request may soon be forthcoming from Washington and that the city officials prepare themselves accordingly. Mr. Austin visited every department in the city hall. He expressed much surprise at the number of men at work about the building. "What do all these men do?" he asked. "Here are a lot of men painting, repairing and making improvements to the building that could be used in war work. All this work here could be postponed for years. There is lots of work that cannot be abandoned, such as the laying of sewers, improvement of the water system and fire department and health measures. If, however, the city purposes to keep on with the subway under city hall, the Frankford elevated, the Parkway and other similar work borrowings of more than $15,000,000 will be necessary which otherwise might be invested in Liberty bonds. While no steel is used in the construction of the Parkway, yet sand, gravel and stone are required, which are needed by the government."

City Treasurer Becomes City Manager.

Sandusky, O.—The city commission has elected city treasurer George M. Zimmerman city manager to succeed George T. Lehrer, who resigned. Lehrer got $3,000 a year. Zimmerman will get $3,600 a year, the salary Kenneth B. Ward, Lehrer's predecessor received. Leroy Hobert, Zimmerman's deputy, was elected treasurer, succeeding Zimmerman, at a salary of $1,500 a year, $900 less than Zimmerman received. No deputy treasurer will be appointed. Both appointments became effective April 1.

State Auditor Finds Discrepancies in City Accounts.

Albany, N. Y.—Discrepancies in the financial accounts of 24 of the 52 municipalities examined last year, varying in amounts from $100 to $3,800 and averaging $976.16, are disclosed in the special report on municipal accounts, submitted to the legislature by state comptroller Travis. In all these examinations, the comptroller's report shows, there was discovered $79,436.39 expended for purposes not legally chargeable, making an average shortage of $100 or more in the accounts of one out of every three municipalities examined. Some of the discrepancies, the comptroller points out, were occasioned by the stealing or peculations of officials, and involved moral turpitude. In several instances, he shows, criminal proceedings have been instituted and the offenders tried and imprisoned. In other cases these deficiencies were attributed to the failure to keep accurate accounts and the neglect of officials to correct errors in their favor. With no disposition to reflect unduly, the comptroller calls attention to the number of errors made against municipalities as greatly outnumbering those against the interest of officials.

TRAFFIC AND TRANSPORTATION

Six-Cent Fare Granted to Interurban.

Phillipsburg, N. J.—The Northampton, Easton & Washington Traction Company of Easton, Pa., has been permitted by the state board of public utility commissioners of New Jersey to increase the rate of fare from five cents to six cents in each of the seven fare zones from Phillipsburg to Port Murray, N. J., a distance of seventeen miles. This follows the application made previously to the commission, but denied by it in July, 1917, because of court rulings, which have since been more liberally construed. At the previous hearing it had been shown that there was a deficit of $7,150 for the year 1915, and a deficit of $5,311 for the year 1916. The additional proofs offered when the appeal to the commission was renewed showed a deficit of $7,131 for 1917, and a comparative deficit for January and February, 1918, of an increased amount. No money had been set aside for depreciation in any of the years mentioned. The net operating return had been and continued to be insufficient to meet interest on the bonded debt, but the interest on the bonded debt of the company had been paid, any deficit in the sum of money required for the payment of interest having been loaned by the Northampton, Easton & Washington Traction Company of Pennsylvania to the New Jersey company. The New Jersey board last July recognized the serious financial condition of the company, but felt that it could not grant it relief because of its interpretation of the decision of the New Jersey supreme court in the case of the Atlantic Coast Electric Railroad vs. the Public Service Commissioners. The company caused the findings of the board in its proceedings to be reviewed by the supreme court, and the decision filed holds that it is the duty of the board to approve the establishment of a just and reasonable rate, when it appears that the existing rate is insufficient regardless of limitations contained in municipal ordinances respecting rates of fare. The July order was therefore set aside and the company renewed its application for the increased fares.

Progress on Chicago's Transportation Projects.

Chicago, Ill.—The local transportation committee of the city council has agreed with the recommendation of the traction and subway commission's physical plan for the immediate construction of three subways and four elevated line extensions. This would provide a complete reorganization of transportation in the city, increasing the rapid transit facilities 150 per cent in the first six-year period. The new plan would serve 60 to 70 per cent of the population with rapid transit where now 20 per cent is served. The program involves the expenditure of more than $100,000,000. The money is at hand. A sub-committee has been appointed to draft an ordinance and submit it to the local committee at an early date. This sub-committee will designate the length of the franchise.

Court Overrules Commission on Diversion of Cars.

Seattle, Wash.—The state supreme court has dismissed the order of the public service commission which required the Puget Sound Traction, Light & Power Company to divert a certain car line through the downtown section of Seattle during the heavy traffic hours of morning and evening. The case has been in the courts for two years. The supreme court held that the through service order granted by the commission in 1915 and later upheld by the superior court of Thurston county was unreasonable and that some inconvenience must be expected in reaching the city by residents of the outlying district. The company contended that its yearly operating expenses would be increased $19,000 by routing its cars through the city. The decision states that in satisfying the public need a carrier is not also bound to satisfy a public convenience at any considerable loss to itself, when the service is already adequate.

Commission Says Cities Should Not Enforce Franchises.

Sacramento, Cal.—The state railroad commission has been making an investigation of the transportation system of the state during the emergency period created by war. It has announced several recommendations. Most of the suggestions are concerned with the problems of steam operation, but one directly affects electric railways and other utilities in California and the attitude of cities towards them in the matter of enforcing franchise requirements. The commission says: "State, county and city governmental authorities should not require utilities, during the present emergency, to live up to franchise requirements which call for improvements, street work, etc., that is not absolutely necessary for operation. Moreover, all public improvements not necessary in the prosecution of the war should be deferred so that the labor and materials may be available for railroads or other necessary war work." On this subject the commission said: "Steam, electric interurban, and street railways, as well as other public utilities, should not be required at this time to live up to such of their franchise stipulations as necessitate otherwise uncalled for new construction, such as street paving in cities, replacement of existing T-rail with more expensive girder rail, and similar items. The latter suggestion will, of course, have its effect also on maintenance and capital expenditures and consequently on the net earnings of the carriers. We recommend that the commission address the appropriate state, county and city governmental authorities, inviting their cooperation with the program. We also suggest that the commission offer its informal assistance in cases where, by reason of franchise requirements, a city insists upon construction work which is not essential and which would appear to interfere with the more important railroad work."

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-24.—LEVEE AND DRAINAGE CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Conference, St. Louis, Mo. Secretary-treasurer, C. S. Gannon, 421 National Bank of Commerce Bldg., St. Louis, Mo.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

Engineering Foundation.

At the recent annual meeting of the Engineering Foundation, held in New York, the following officers were elected for 1918: Chairman, Michael I. Pupin (re-elected); vice-chairmen (two), Edward Dean Adams and (new) W. F. M. Goss; secretary (re-elected), Alfred D. Flinn; treasurer (re-elected), Joseph Struthers.

American Association of Engineers.

A ballot has been sent out to about 250 engineering societies by the American Association of Engineers for the purpose of securing an opinion on public questions to be taken up at the fourth annual convention of this association, May 14 next, in Chicago.

The letter transmitting the ballot characterizes the first proposition to be voted on, the desirability of passing the bill incorporating the American Academy of Engineers, as undemocratic and un-American. According to the letter, this bill seeks to establish an aristocracy of engineers.

The second question, regarding the granting of A-1 priority for equipment needed for drainage work, is commented on in the letter of transmittal as involving the serious question of producing sufficient foodstuffs during the next year.

The third question is that of universal military training. It is proposed later to submit referenda on the licensing of engineers, railway ownership and similar subjects.

This, according to A. H. Krom, general secretary of the association, is the first effort to obtain the opinion of the engineering profession on national questions by referendum.

The committee on engineering co-operation unites in extending an invitation from the American Association of Engineers to other organizations, asking them to send delegates to the annual meeting of the association in Chicago May 14 to consider co-operative plans.

Western Society of Engineers.

The Western Society of Engineers recently held a meeting at which the subject of discussion was "Meeting the Material Situation." The work and purpose of the Priority Division of the Council of National Defense and the administration of priority regulations governing the distribution of construction materials were explained. Three papers were read on the question, "What the Engineer Can Expect from Industries Supplying the Basic Engineering Materials." "Structural Steel Plants" were discussed by F. J. Llewellyn, division contracting manager, American Bridge Co.; "Lumber Industry" was taken up by Herman von Schrenk, consulting timber engineer, and "Concrete" was the topic of B. F. Affleck, president Portland Cement Association.

Levee and Drainage Contractors' Association of the United States.

A conference is to be held at St. Louis, April 23-24, by the Levee and Drainage Contractors' Association of the United States. The purpose of the meeting will be to demonstrate how the food production of the nation may be increased by bringing under cultivation millions of acres of arable land now uncultivated because of overflow or too much water. All who are interested in this purpose are invited to participate in the conference.

The president of the association is Otto Kochtitzky, Cape Girardeau, Mo.; C. S. Gannon, 421 National Bank of Commerce Building, St. Louis, Mo., is secretary and treasurer.

Wyoming Engineering Society.

Engineers from almost all parts of Wyoming were recently in Cheyenne for the purpose of forming an engineering association. The organization was formally launched at the closing session of the meeting under the name of the Wyoming Engineering Society.

F. C. Emerson, of Worland, was elected president; Professor J. C. Fitterer, of the University of Wyoming, was chosen vice-president, and H. C. Watson, of Cheyenne, treasurer.

A banquet in the Plains Hotel

(*Continued on page 292.*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

STREET IMPROVEMENTS are to be made by Lake Alfred, Fla. The engineer retained for the improvement is J. W. Turner.

Trenton, N. J., is to construct a steel and concrete BRIDGE. J. W. Thompson has been retained as consulting engineer for the structure.

In making SEWER extensions Sleepy Eye, Minn., has the consulting engineering services of the firm of Burns & McDonnell.

Victor, Ia., is to improve its SEWER SYSTEM. Plans and specifications for the work have been completed by the engineering firm of M. Tschirgi & Sons.

Holyoke, Colo., is to make improvements to its WATER WORKS SYSTEM and to construct a SEWERAGE SYSTEM. Royal D. Salisbury is consulting engineer, and has prepared plans and specifications for the work.

The town board of Manville, Wyo., is contemplating the installation of a LIGHTING SYSTEM and the construction of a SEWERAGE SYSTEM. C. C. Carlisle has been retained to advise the officials.

The village of Lovington, Ill., is to make STREET IMPROVEMENTS. The engineer for the work is L. W. Lemon.

Carthage, S. D., is to build a large steel tank for its WATER SUPPLY. The engineer for the structure is J. F. Druar.

New machinery is to be installed in the WATERWORKS of North Canton, O. The engineering firm of Cuiler & Rice is in charge of the work.

Marshall County, Holly Spring, Miss., is to make HIGHWAY IMPROVEMENTS. The engineer for the work is Joseph P. Carey.

St. Francis County, Little Rock, Ark., is to make extensive HIGHWAY IMPROVEMENTS. Plans for the work were prepared by the consulting engineering firm of Herring & Schellhons.

Summit County, Akron, O., is to install WATER and SEWAGE DISPOSAL PLANTS at the county infirmary. M. P. Lauer has been retained to prepare plans and specifications for the improvements.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

HIGHWAY CULVERT PIPE.

Short Lengths of Cast Iron Pipe for Saving Labor.

With the ever-increasing scarcity of man-power for building our roads many manufacturers have come forward with helpful suggestions, with machinery with which one or two men can do the work of many, and with methods of making materials easier to handle.

Realizing that short lengths of cast iron culvert pipe can be installed with fewer men, the U. S. Cast Iron Pipe and Foundry Company, of Burlington, N. J., is now offering its cast iron culvert pipe in 4 ft., 6 ft., 8 ft., 12 ft. and 5 meter (16 ft., 5 inches) lengths. In many cases the last two lengths mentioned can be used to good advantage, but in inaccessible places the shorter lengths are much cheaper to handle. This is the first time bell and spigot cast iron pipe has been available in lengths under 12 ft., and those interested in highway construction will appreciate the advantage of the lighter units.

Where head-walls are used it is often desirable to have a bell at either end of the culvert. This helps to maintain true alignment and at the same time gives a finish to the job. To produce this it is possible to secure what is known as the "crown length" of cast iron culvert pipe. This is a 12-ft. length of pipe with a bell on either end, as shown in the illustrations.

The cross-section shown here indicates the advantage of this "crown length." It is placed under the crown of the road, doing away with center joints and the possibility of undermining at that point. By the use of the "crown length" the engineer secures a more even distribution of strength in the part of the road where it is most needed, and at the same time may finish the culvert with shorter lengths if desired.

Beside the labor economy of the shorter lengths the economy due to the long life of this pipe should be an important factor to those who are building for permanence.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but there is still a tendency to cut where business is competitive. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A $1 extra.

Federal Price-Fixing Board.

The Council of National Defense recently gave out the following statement:

Under the authority of the War Industries Board there has been created a body to be known as the price-fixing committee, with its personnel composed of Robert S. Brookings, of the War Industries Board, chairman; Brigadier-General Palmer E. Pierce, Surveyor-General of Supplies for the War Department; Paymaster John Hancock, of the Bureau of Supplies and Accounts of the Navy; Dr. H. A. Garfield, Fuel Administrator; F. W. Taussig, chairman of the United States Tariff Commission; W. J. Harris, chairman of the Federal Trade Commission; Hugh Frayne, of the War Industries Board, and Bernard M. Baruch, ex-officio. Another civilian member of the committee will later be appointed.

The duties of the price-fixing committee will be to pass upon prices for all basic raw materials and to establish from time to time a price-fixing policy, to be submitted to the President for approval. Any of the executive departments having difficulty in the handling of price-fixing matters will have the advice and assistance of the price-fixing committee when desired.

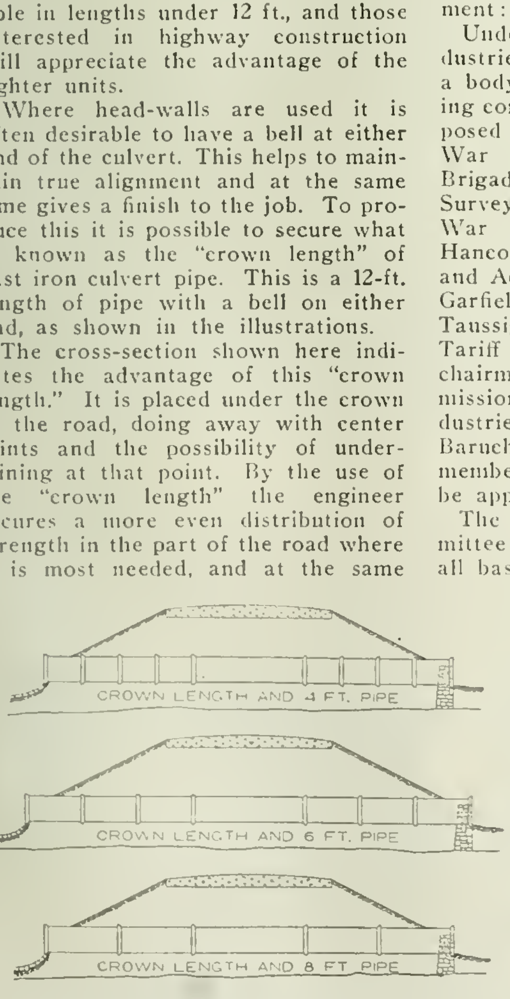
The object of the price-fixing committee is twofold: First, it will be a separate body, quasi judicial in nature, for the purpose implied in its name, and it will serve this purpose through being made up of men separated so completely from industrial interests that their motives and actions in the determination of prices can be subject to no suspicion of mercenary interest. Prices will not be made until after costs have been passed upon by the Federal Trade Commission. With costs as a basis the price-fixing committee will then consider problems of production and distribution before arriving at its decisions.

The second object to be achieved by the price-fixing committee is speed. The committee will sit all the time, and will thus eliminate unnecessary delay caused by the consideration of price-fixing problems in several different quarters.

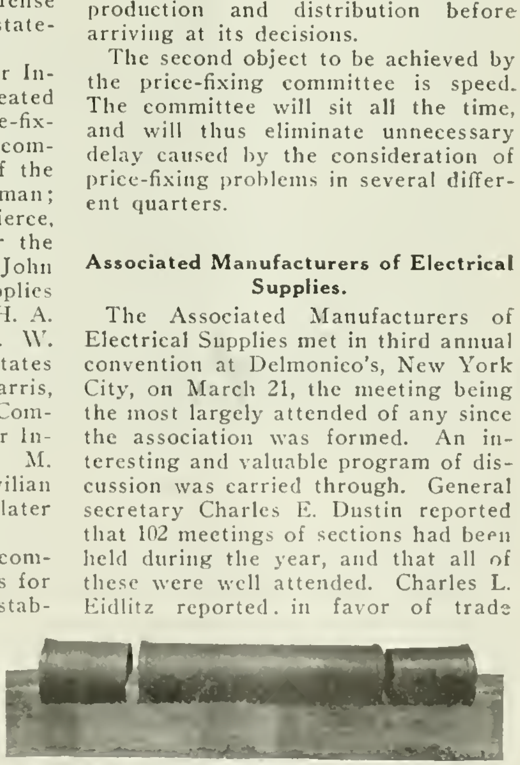
Associated Manufacturers of Electrical Supplies.

The Associated Manufacturers of Electrical Supplies met in third annual convention at Delmonico's, New York City, on March 21, the meeting being the most largely attended of any since the association was formed. An interesting and valuable program of discussion was carried through. General secretary Charles E. Dustin reported that 102 meetings of sections had been held during the year, and that all of these were well attended. Charles L. Eidlitz reported. in favor of trade

USE OF "CROWN LENGTHS" OF CAST IRON CULVERT PIPE.


CROWN LENGTH AND 4 FT. PIPE
CROWN LENGTH AND 6 FT. PIPE
CROWN LENGTH AND 8 FT. PIPE

The installation of Crown Lengths in conjunction with the various other Lengths available.



Crown Length and 4-foot Lengths before assembling.

Crown Length and 4-foot Lengths as they will appear in the trench.

acceptances, and after an interesting discussion the matter was referred to the board of governors for further consideration.

The following officers were elected for the ensuing year: President, A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; vice-president, B. E. Salisbury, Pass & Seymour, Inc., Solvay, N. Y.; treasurer, J. W. Perry, H. W. Johns-Manville Company, New York (re-elected); general secretary, Charles E. Dustin, New York.

The annual banquet, held on Thursday evening, was well attended. The retiring president, H. B. Crouse, presided.

Mack Trucks in Road Work in France.

Motor trucks by the thousands will help effectively the U. S. Road Engineers engaged in new construction back of our lines. It is estimated that one thousand two hundred miles of highways will be built in 1918 by American road engineers in the rear of the firing line in France. To the special road building battalions is delegated the important task of keeping lines of communication constantly open. Among the trucks engaged many Mack trucks, made by the International Motor Co., New York, N. Y., are working in conjunction with modern American road machinery helping to build new strategic lines and keep communicating roads in constant repair. The Mack fleet will be composed of several thousand dump trucks, hot road oilers, pressure sprinklers for making waterbound macadam, gasoline tank trucks, printing press trucks for printing blue prints, instructions, plans, reports, etc., machine shop trucks, blacksmith and tool repairing trucks.

NEWS OF THE SOCIETIES

(*Continued from page 290.*)

brought to a close the first gathering of the engineers.

Cheyenne was again selected as the city for the next meeting of the society, which will take place some time in January, 1919.

The engineers visited the city filtration works at Round Top. The rest of the day was spent in devising and adopting a constitution.

It was decided that the membership of the society should be divided into three classes: Regular members, associate members and junior members. Qualifications for regular membership will consist of having had at least three years' experience in a responsible engineering position and one year's residence in the state. A degree from a recognized engineering college will be accepted in lieu of one year's working experience. The requirements for an associate member are two years of experience in charge of engineering works and one year's residence in the state. Any one having reached the junior year at an engineering college will be accepted as a junior member.

The object of the society is to bring the engineers of the state into closer relationship with one another; discussion of problems pertaining to the engineering profession, and the co-ordination of efforts in bringing about any necessary legislation relative to engineering in the state.

Recommendations for amendments to the existing laws in the state regarding the licensing of engineers will be submitted at the next session of the state legislature.

Highway Traffic Association of New York.

A public meeting of the Highway Traffic Association of the State of New York will be held in the grill room of the Automobile Club of America, 247 West 54th street, New York City, at 8:30 p. m. on Tuesday, April 16, 1918. Mr. S. M. Williams, president, Highway Industries Association, will speak on the topic "Highway Transportation Jeopardized." The address will be followed by a general discussion.

Oregon Society of Engineers.

Under the auspices of the Oregon Society of Engineers E. B. Thompson recently gave an illustrated lecture before the members of the American Society of Civil Engineers, American Institute of Electrical Engineers, National Electric Light Association, Northwestern Association of Highway Engineers, Oregon Society of Engineers and others on "The Oregon City Locks."

North Dakota Society of Engineers.

An unusually large number of members attended the recent tenth annual convention of the North Dakota Society of Engineers held at Fargo. The sessions were especially concerned with land drainage and highway construction as well as to the distribution and consumption of fuel. Officers for 1918 were elected as follows: President, E. J. Thomas, city engineer of Minot; vice-presidents, G. W. Heinmiller and W. R. Veigel, city engineer of Carrington and Dickinson. Prof. E. F. Chandler, University, N. D., is secretary. Next year's convention will be held in Valley City.

PERSONALS

Chipley, Dudley, has been appointed engineer for Muscogee County, Ga., to succeed the late J. R. Lane and the late L. A. Scarbrough.

Hanson, Ole., was recently elected mayor of Seattle, Wash.

Conway, John F., who was chief of the Jersey City, N. J., fire department for twenty-three years, died recently at his home, aged sixty-three years.

Amiss, Thomas, L., has been appointed superintendent of the Shreveport, La., water department to succeed W. R. Goss. Mr. Amiss, who has been assistant superintendent, has been with the department over seventeen years.

Leo, John P., an architect, has been appointed chairman of the Board of Standards and Appeals of New York City at a salary of $7,500 a year.

Strauss, Charles, has resigned his position of Commissioner of the Board of Water Supply, New York City, on the ground that with the practical completion of the Catskill Aqueduct system the present commission of three members was not justified. Each receives $12,000 a year.

Greenleaf, W. A., has been appointed city engineer of Independence, Kan., succeeding George E. Weaver, who served in that capacity for six years. Mr. Greenleaf was formerly construction engineer with E. T. Archer & Co., Kansas City, and before that engineer of the Omaha (Neb.) Water Company.

City manager H. G. Otis, of Auburn, Me., has appointed G. H. Stevens city engineer and reappointed street commissioner Rowe.

Whitney, Harrie L., has resigned his position as city engineer of Beverly, Mass., which he has held for eleven years.

Sanborn, Osmund P., is now chief engineer of the Biddeford, Me., fire department.

The following were recently elected in Cumberland, Md.: Mayor, Dr. Thomas W. Koon (re-elected); commissioners, Charles C. Deetz, Harry L. Smith and Dr. Theodore A. K. Hummelshime.

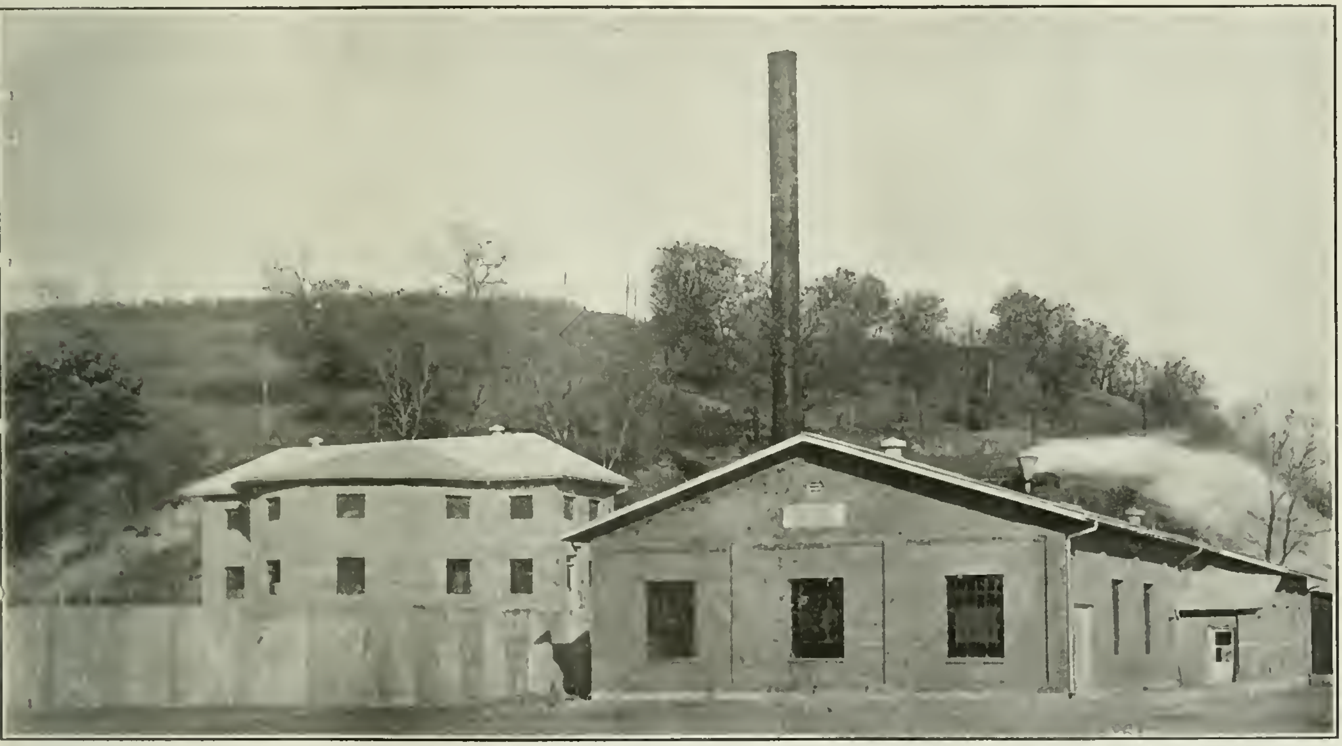
TYPE OF MACK TRUCK AT WORK ON ROAD-BUILDING "OVER THERE."

Municipal Journal

Volume XLIV. NEW YORK, APRIL 13, 1918 No. 15

RECONSTRUCTING WATER PLANT WITHOUT INTERRUPTING SERVICE

Fort Madison, Iowa, Replaces Old Pumps, Boilers and Buildings with New, One Item at a Time—Also Builds Storage Reservoir and Filtration Plant, and New River Intake.



FORT MADISON'S NEW WATER WORKS PLANT.
Pumping station and coal storage on the right; settling basin, filter house and head house on the left

The building of a new water works plant on the exact site of an old plant, and entirely removing every vestige of material and equipment of the old plant and replacing it with new, and without interruption of service, calls for an unusually close study of the engineering features and a careful handling of the construction work and material. It is not an unusual thing to replace an old steel bridge with a new one without interfering with traffic, but in bridge work you at least have a few minutes interval between trains; but in supplying a community of fifteen thousand people with continuous water service, a single interruption, even for a minute, not only jeopardizes the property of the city, but the safety of the citizens as well.

Many municipalities and water companies hesitate about carrying out improvements because of the fear of interruption of service and the criticism that this interruption might bring. However, in the case of the Fort Madison, Iowa, water works, criticism had already reached an alarming stage because of the quality of the water and insufficiency of the fire pressure, and it became incumbent upon the city to provide a more satisfactory water and a better fire service. The city was without bond power to provide for a municipal plant, consequently twenty-five of the leading citizens organized the "Citizens' Corporation," which was granted a franchise, and they immediately took over the old property and began the reconstruction of the entire water works plant, involving an expenditure of about three hundred thousand dollars. The criticism and suspicion arising from the operation of the old plant was a lesson which caused the new corporation to exert every effort to avoid the errors of the past and to rescue, if possible, an unprofitable business and to adopt measures of economy and efficiency that would make the new project profitable. The consulting engineers, in preparing the plans and specifications for machinery and equipment for the pumping plant, power plant and filtration system kept in mind the previous unprofitable business and exerted every effort to provide an equipment that would not only give the very best of service but do this at a minimum of expense.

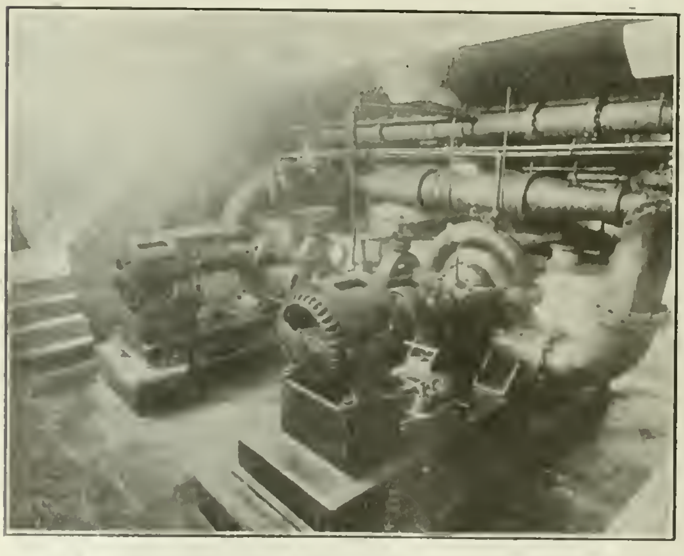
The old station, like many of the early-day water works plants, contained pumping machinery that was obsolete—a power plant that was merely a fuel consumer, with no check on the wastage of water; and, with frequent changes of ownership and management, a sorry condition existed. The old station contained two high-service pumps, but examination disclosed the fact that only one was in condition to be operated.

As the first feature of the reconstruction, the old brick building was torn down around the old pumps and boilers, all equipment was covered with canvas and excavation started for the new structure. Unfortunately it was impossible to select weather suitable for the work, and practically the entire construction work was carried on throughout severe winter weather. In making the excavation for the new structure, it was necessary to take up the old discharge lines from the pumping plant, replacing them with temporary connections.

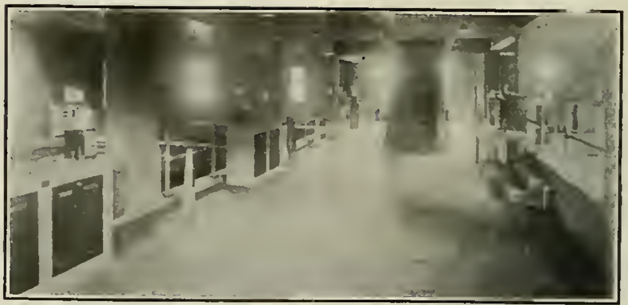
The first work started and completed was a million-gallon reinforced concrete storage reservoir, thus enabling some storage of water in case of interruptions in operation of the pumping equipment. One old boiler was discontinued and displaced; foundations were built and the new boiler was then erected and put in commission. Then the second old boiler was removed, foundations were built for the second boiler which was then connected and enclosed in new steel casing.

A temporary smoke stack was built, using old corrugated iron culverts and supported above the boilers by a frame of structural steel taken from the old building. The temporary stack was held in place by guy wires placed at such height as not to interfere later with the placing of roof trusses and other building operations. A complete new stack was then erected, and as soon as the new boilers were placed the new breeching was put in place and connected to the new stack. During the time these changes were being made the building was being constructed and firemen, engineers and operators had to be protected by canvas covers stretched over a frame-work over the boilers and pumps; but in spite of the severe winter weather, this work was carried on without interruption.

In the pump room a new concrete foundation was erected and the new pump was set in place. New steam connections were made at once and the old pump was removed by dynamite, since, having seen some thirty-two years of service and having been welded together twice to keep it running, it was not considered valuable enough to save. Fortunately, the new pump had all of its connections completed and was just ready to be placed in service when suddenly the old pump gave up its struggle and practically went to pieces like The Wonderful One-Horse Shay—"all at once and nothing first—just as bubbles do when they burst." Steam was turned into the new pump immediately after the collapse of the old pump and continuous service was maintained with scarcely an interruption except for a few minutes for adjustments to the new pump.



TWO LOW-SERVICE PUMPS, DELIVERING WATER TO SETTLING BASINS AND FILTERS.



INTERIOR OF FILTER HOUSE.
Filters and operating stands on the left.

The new high-service pump is a three-million gallon Corliss fly-wheel, which, owing to its high efficiency, is kept in operation continuously, there being reserved for emergency a three-million gallon duplex pump whose efficiency is less and the first cost investment in which is less. The low-service pumps are motor driven and are in duplicate, consisting of two three-million gallon units, delivering water from the intake in the Mississippi river into concrete-lined basins, from which the water flows through four three-quarter-million gallon capacity mechanical filter units. Duplicate generating units generate the electricity for the operation of the low-service pumps; also furnish power for the operation of the blower and wash water pump used in the filter house, besides furnishing electricity for lighting the entire water works installation and grounds.

The power plant of any water works installation can be a money-maker or a money-loser, depending upon its efficiency; and in this installation equipment was provided to secure the highest efficiency. All the coal is weighed on permanent scales, and the boiler feed water is weighed with automatic recording devices that determine the amount of water evaporated for the amount of coal used. Thus a constant check is obtained at all times on the amount of steam that is produced by a given amount of coal, and the ability and industriousness of each fireman is readily ascertained by these records, which are so arranged as to tell at a glance the record day by day or from year to year, as to the amount of coal consumed, amount of water evaporated, amount of water pumped and the fuel cost per thousand gallons. If the record of a fireman one month is not as good as a previous month, merely a glance will determine this and a good excuse must be forthcoming by the superintendent; otherwise a new fireman takes the job.

A new intake was built into the Mississippi river, this being necessary because the building of the Keokuk dam had raised the level of the water in the river at Fort Madison about fifteen feet and it was desirable to have the new intake placed considerably above the bottom of the river bed in order to avoid drawing in the sediment that will undoubtedly accumulate.

All the water is metered in passing from the low service pumps to the filtration system. This is essential because centrifugal pumps constantly pumping water containing sediment lose their efficiency and a constant check was desired in order to determine when and how often new impellers should be placed in the low service pumps.

INTERIOR OF PUMP ROOM, SHOWING HIGH-SERVICE CORLISS ENGINE.

As a further check on the wastage of water, all water is metered in passing from the high service pump to the storage reservoir and into the mains. This double check on both high service and low service delivery enables a prompt determination of where any leakage occurs and measurements can be taken in order to account for all the water delivered. A universal meter system is being adopted throughout the twenty miles of cast iron distributing mains, in the belief that the only business-like way of selling water or any other commodity is by absolute measurement of the volume.

The purification plant contains a large mixing chamber into which the coagulant is fed with dry-feed chemical machines. The dry-feed machines avoid the trouble of mixing in chemical solution tanks and trouble with agitators in the solution tanks. The sulphate of alumina is fed in pulverized form, going into solution in the mixing chambers. Car-load capacity storage for chemicals is provided on the third floor of the filter house. With the storage and dry-feed machines as provided, the plant is free from disagreeable odors that are not unusual around a water purification plant.

A concrete settling basin was built on a fill placed there by deposits of the creek which had its course over the ground. Information showed that a sawdust mill operated on the site fifty years ago, and this sawdust did not prove, upon sounding, to be a very satisfactory foundation. The settling basin was therefore placed on a large reinforced concrete slab, the reinforcing consisting of seventy-five tons of old steel rails. The basin has been in place about a year and measurements show that the settlement has been less than one-eighth of an inch.

The water flows by gravity from the settling basin into four three-quarter-million gallon filter units which were installed by the Pittsburgh Filter Manufacturing Company of Pittsburgh, Pa. The filters are arranged all in one row in a large, well-lighted room. The filter gallery beneath the filter floor has all of its pipes and valves accessible, with plenty of head-room and working space and with all piping arranged on one side only, which is thought to be a decided improvement in the arrangement of filter piping.

The general construction being of a complicated nature, involving unforeseen conditions, was handled on a cost plus percentage basis by the Wodrich Construction Company of Minneapolis, which plan of handling the work proved very satisfactory.

The pumping machinery and steam power plant equipment was furnished and erected by the Merkle Machinery Company of Kansas City, Missouri, and much of their erection was handled on a cost plus percentage basis.

The filter equipment was handled in a third contract by the Pittsburgh Filter Mfg. Company, and recent tests of the water by the state chemist of Iowa show a reduction of bacteria of 99.75 per cent, the raw water containing 1,600 bacteria per c.c., and the filtered water only 4 bacteria per c.c. Another test that is very important is that for colon bacillus. Three separate and distinct tests have recently been made by the state chemist and no trace of harmful bacteria or disease germs can be found in the water. The only chemical coagulant now used is sulphate of alumina, and the results are so satisfactory from a health standpoint, and also in securing a pure, sparkling water, that the domestic consumption has increased rapidly since the new plant was placed in operation about six months ago. Hundreds of new consumers are being added and the citizens are realizing that with mechanical filtration and the further precaution of liquid chlorine application, an absolutely safe water is furnished at all times.

Seven miles of mains were added to the old distribution system, and by the use of existing gate valves these extensions were added and connections made with but slight interruptions of service in various parts of the residential district. Larger reinforcing mains were laid in the business district and a duplicate supply line reaches from the main pumping plant to the business district of the city. The construction of the distribution system as handled by Stephen Schulte of Fort Madison shows that it is possible to lay water mains and put them in service almost as fast as they are laid, for the corporation was desirous

INTERIOR OF FORT MADISON PUMP ROOM.
Showing Corliss high-service pump and two direct-connected generating units for lighting station and operating low-service pumps.

of securing revenue as each block of extensions was completed. This was made possible with the plentiful use of gate valves and the prompt making of house-connections before the trenches were filled in.

The entire engineering work, such as plans, specifications and supervision of construction, was handled by Burns & McDonnell, of Kansas City, Missouri, and their supervising engineer, C. E. Painter, has remained in charge of the operation of the plant.

The entire installation, because of its displacing entirely an old and inadequate system and also because of its being the most modern installation in the State of Iowa, has proven of special interest to officials of many municipalities throughout the country, delegations from many other cities having visited and inspected the installation.

The financing and management of the entire project was accomplished by home capital under the leadership and direction of T. T. Hitch, president of the Citizens' Corporation, with the able assistance of Peter Kern, secretary.

Hundreds of water plants throughout the country could profitably carry out similar reconstruction, but unfortunately many owners and operators of water plants, both private and municipal, lack the essential quality of nerve to scrap an old plant when it becomes obsolete.

WATER PURIFICATION IN THE CANAL ZONE.

Spraying Removes Odors and Free Carbonic Acid—Change in Point of Application of Alum Lengthens Filter Runs.

The water purification plants operated by the U. S. Government in the Canal Zone at three points, and known as the Agua Clara, Mt. Hope and Miraflores, were described in Municipal Journal about a year ago and considerable information given concerning their operation. In the report of Geo. C. Bunker, physiologist of the Canal Zone, for the year 1917, some additional and new features are discussed.

At Mt. Hope the water is discharged through 85 cone nozzles adjusted at an angle of 30 degrees with the vertical, the water ordinarily breaking up into fine drops. By this spraying the percentage of saturation of dissolved oxygen is maintained at about from 91 to 94, being increased where the saturation of the raw water is less than this and decreased where it is greater. In addition, a considerable amount of carbon dioxide is removed. An odor of hydrogen sulphide of a numerical value of 5 (Whipple's scale) is completely removed by the spraying action of the nozzles.

During the year the point of application of the alum solution was changed from the discharge end to the inlet end of the aeration basin so that it would be added to the raw water before the latter passed through the nozzles. This change was made in order to remove by aeration the free carbonic acid liberated by the formation of aluminum hydrate, thereby reducing the amount going on the filters and increasing the length of the filter runs. As the amounts of free carbonic acid in the aerated water decreased, the length of filter runs immediately began to increase. The shortest run for any one filter during the ten days prior to the change in treatment was 13.7 hours, and the longest run was 23 hours. During the nine days following the change, the shortest run was 28 hours and the longest run was 59.5 hours. The physical and chemical characteristics of the raw and filtered water remained practically the same immediately before and after the change in the point of application of the alum. The number of micro-organisms and amount of amorphous matter in the raw water did not show any notable variation.

The monthly mean amounts of free carbonic acid in the settled water previous to the change varied from 3.0 in August to 9.0 in March, and the length of filter runs (averages by months) varied from 12.3 in February to 29.3 hours in November. After the change in point of application of the alum, the monthly mean amounts of free carbonic acid varied from 1.5 in May to 7.3 in August, while the filter runs varied from 30.1 hours to 47.6 hours, or the length of run was more than doubled on the average. During the year the number of filter washings was decreased 729, with a resulting saving of 39,639,000 gallons of washing water; the percentage of washing water for the year before and after the change being 5.9 and 3.4 respectively.

At the Agua Clara purification plant an experimental box aerator 4 by 8 ft. and 4 ft. deep, patterned after those used at So. Norwalk, Conn., was built over the inlet of the mixing chamber. The bottom was perforated with ½-inch holes spaced 1½ inches, center to center, and was so located as to give a fall of 4 ft. to the water. A by-pass from the raw water main brings the water up to the top of the box, where it discharges into a trough from which it splashes over and down to the perforated bottom. The alum solution was applied to the raw water at a point about 18 ft. back of the open end of this by-pass, with the idea that the liberation of free carbonic acid due to the formation of aluminum hydrate is effected before the water passes through the bottom of the box. The primary object of this aerator was to remove part of the free carbonic acid so as to reduce the amount of lime which is later applied to the partially settled water. It was found that the aerator resulted in a reduction of the free carbonic acid by from 56 to 76 per cent. In addition, the aerator was of service in removing odors from the raw water.

Prior to the installation of this aerator it had been thought that the rough handling of the initial alum floc would possibly result in a slowing up of the subsequent coagulation in the deposition of a larger amount of suspended matter in the second section of the settling basin. It was found, however, that during the flow in the mixing and distribution channels after leaving the aerator, the floc reassembled in sufficiently large masses to insure the deposition of the greater part of the sludge in the first section of the basin. During the first half of the year an attempt was made to deliver to the filters a settled water of low free carbonic acid and color content. In August, 1916, the iron content of the raw water started to rise from 1.05 parts, and, following heavy rains which washed a considerable amount of red clay into the reservoir, gradually reached a maximum of 3.0 parts in the first part of October. The apparent of the raw water remained at about 65 parts and the true at about 35 parts (filtered through a Berkefield filter) until October, when the former increased to the maximum for the year, 95 parts, and the latter to 45 parts. During this period the alum was maintained at about 360 lbs. per million gallons. In order to reduce the free carbonic acid liberated by this amount of alum and lengthen the filter runs, the amount of lime was gradually increased to 300 lbs. in the last part of August and finally held at about 225 lbs. per million gallons.

The greatest variations in the iron and color of the filtered water occurred at the same time, the former ranging from 0.05 to 0.65 and averaging 0.4 during the weeks of high color in the raw water; and the latter ranging from 1 to 22 parts and averaging 8 parts.

The period of sedimentation was not sufficiently long to properly prepare a raw water of high color and iron content for later treatment with lime. The amount of color and iron carried over into the second sections of the settling basins by the heavy alum floc was so large that the addition of a sufficient amount of lime to reduce the free carbonic acid to about 1 part and to raise the alkalinity to 20 parts would invariably result in an increase in color in the filtered water through a "fixing" of that mixed with the floc. The weekly and bi-weekly cleanings of the basins seriously interfered with the lime and alum treatment on account of the break in the normal operation of the plant by overloading the other basin and requiring a quick return to service of the cleaned basin. From October 7, 1916, the iron and color of the raw water gradually decreased, the iron dropping to 0.50 part on December 2, and the color to 25 parts three weeks later.

With these reductions in color and iron in the raw water, the alum was reduced to 120 pounds per million gallons, following a similar decrease in color of the raw water to 36 parts. The lime was also reduced from 100 pounds on January 13, 1917, to 25 pounds per million gallons on March 10, averaging 45 pounds during the remaider of the fiscal year.

Starting with the week ending December 2, it was found feasible to neutralize all of the free carbonic acid in the settled water and to add 5 to 10 parts of normal carbonate alkalinity ($CaCO_3$), and at the same time to reduce the color of the filtered water to 7 to 10 parts and the iron to less than 0.3 part. This method of treatment possesses the following advantages:

1. The lengths of the filter runs are increased to an average of 65 hours, and the per cent of wash water reduced.
2. The cost of the operation is reduced.
3. The rate of the corrosive action of the water on galvanized iron and lead pipes is slowed up.
4. The multiplication of bacteria in the second section of the settling basins is limited.
5. A reduction in the bacteria in the filtered water results during the period of storage between the time of pumpage of the water from the plant and its withdrawal from the distribution system by consumers.

The disadvantages are:

1. A faint flat taste results from the removal of all the free carbonic acid, which is not noticed by the average consumer.
2. An excess of normal carbonates leads to the formation of a soft cream-colored deposit in galvanized iron pipes, of which the rapidity of the accumulation increases as the rate of circulation through the pipes decreases.
3. The hardness of the water is increased about 10 parts, making a total hardness of about 26 parts.

From July 1 to August 16, liquid chlorine was applied to the filtered water at Mt. Hope as it flowed from the clear-water basin to the suction well in the pumping station, through a concrete gutter 3 by 3 ft. in section and 12 ft. long, with velocities ranging from 0.4 to 1.5 ft. per second. It was found that the maximum amount which could be applied to the water without imparting a chlorine taste to the water in the distribution system was 1.75 pounds per million gallons, or 0.21 parts per million of available chlorine.

With 1.66 pounds per million gallons, a reduction of bacteria was obtained from 304 to 4 per c. c. in the filtered effluent as collected at the pump discharge, but a multiplication occurred in the distribution system, reaching 100 per c. c. as an average of 90 samples; 2.3 per cent of the samples giving between 500 and 700 colonies.

As in the previous report, attention is called to the negative bacterial efficiency of the filters, the colonies increasing from 286 in the settled water to 304 in the filtered effluent. It has seemed impracticable to keep the filters even approximately sterile for any length of time. Even if the filters were made practicably sterile, it seemed impracticable to obtain sterile wash water, and with the first washing of the filter it was re-seeded. The bacteria that grew in the filter were undoubtedly nonpathogenic. An effort was made to sterilize the wash water by means of chlorine, but this seemed to be impossible without production of taste or odor, and no method has been devised for preventing the multiplication of bacteria in the wash water tank.

OPERATION OF SEWAGE WORKS IN IOWA*

How to Secure Proper Operation of Plants—Supervision by Designing Engineer—Directions for Operators.

BY J. H. DUNLAP†

INSURING PROPER OPERATION.

The important question now remains: What can be done to insure the proper operation of our sewage treatment plants here in Iowa, at present so neglected? It is said that misery loves company. Judging from all accounts, Iowa has plenty of company in its neglect of sewage treatment plants. Our neighboring states are many of them facing the same problem.

Four remedies for the maladies of sewage works in Iowa will be suggested. First, it must be said that no plant can be properly operated unless it is properly designed in the first place. While there seem to be plenty of Iowa engineers who understand the principles of design, yet in the past some irresponsible work has been done. In this regard the Iowa State Board of Health is now rendering a most valuable service to the municipalities of Iowa by its requirement that all plans be stamped with its approval. This is likewise a great service to the sanitary engineers of the state, as indeed they recognize, since it insures work of high grade by all competitors.

Second, with the present requirements of the State Board of Health meeting with such favorable results, it apparently is now time for the Board to add another requirement to its present list, namely, that engineers include in their contracts an agreement to operate for at least one year every sewage treatment plant designed. If this is made a requirement of the State Board of Health, then all engineers will be forced to include in their financial agreements with our towns and cities a sum sufficient to cover the cost of this inspection and operation. If it were not a requirement by the State Board of Health, some engineers might wish to name a fee high enough to include operation, but might find it impossible in the face of competition from other engineers who might feel that this was unnecessary.

By such supervision of operation of each sewage treatment plant for a period of at least one year two results would ensue. One result would be that every new sewage treatment plant would be properly operated during a most difficult period of its existence. A second beneficial result would be that incidentally each engineer would have an opportunity to try out under actual operating conditions all the features of his design. Such experience would prove invaluable. During the year of operation some competent man could be trained properly to care for the plant, make the proper tests, and fill out

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*Concluded from page 278.

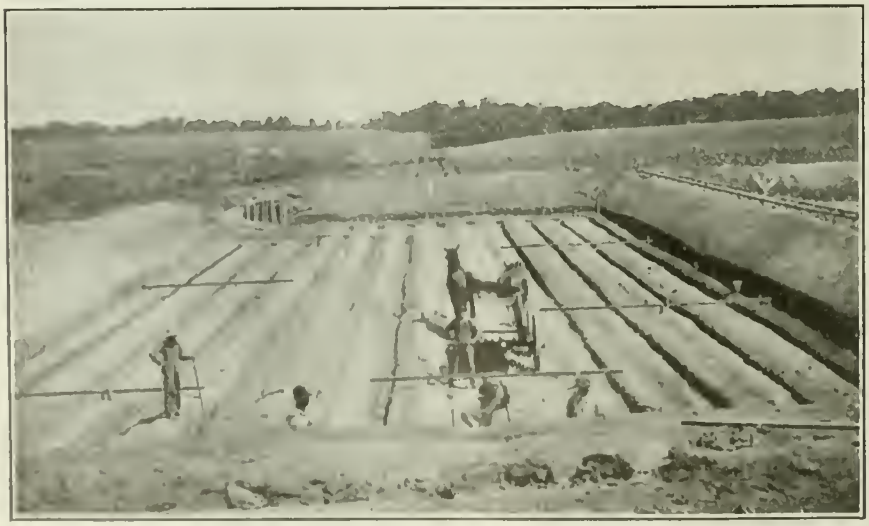
†Associate Professor of Hydraulics and Sanitary Engineering, State University of Iowa.

GENERAL VIEW OF PLANT AT WOODWARD.
At left, superstructure over Imhoff tank and siphon chamber; at right, two sand filters.

the proper reports for the State Board of Health. In instructing the local operator of the plant, it must be kept in mind that this individual is a more or less transitory character. Accordingly explicit directions for each detail of operation must be made out and left where they will not be forgotten or lost. Probably the best plan is to have such directions framed and hung in the tool house at the plant. These directions should not neglect some parts of the plant while being very comprehensive about other parts. Some of the engineers of Iowa already are conscientiously leaving such directions. In no case have they been found, however, at the plant itself. In most instances they were filed away by city clerks with other like material and forgotten.

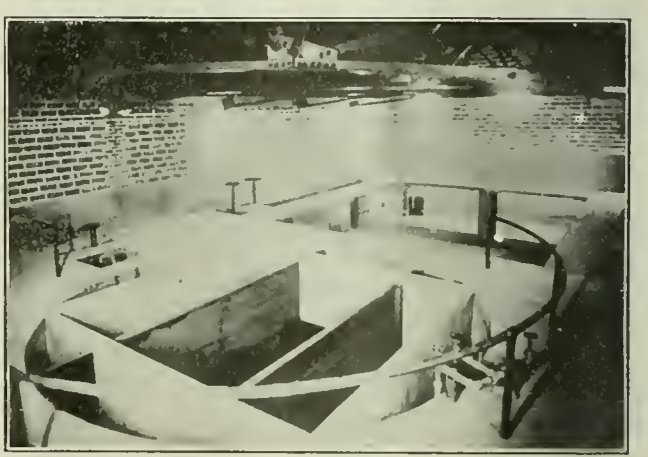
Engineers must remember that the average individual does not understand blue prints. They mean little or nothing to men of the type who will operate the sewage plant. Accordingly a free use of isometric or perspective drawings should be made, as well as of photographs taken during the process of construction. These drawings and photographs, when properly framed and hung in the tool house, would preserve in a form easily understood the essential facts concerning the construction of the plant. This is especially necessary in the case of Imhoff tanks, which are now coming to be so common in Iowa. The average man finds it impossible to understand from blue prints the underlying principles of design and operation of Imhoff tanks. He can learn more from one isometric drawing, or perhaps from one photograph taken at the proper time during construction, than from a whole volume of blue prints.

The chances are that the operator of the sewage treatment plant will have had no technical training whatever. The operators of the 39 sewage treatment plants visited on this inspection trip may be classified as follows: 12 of the plants had no regular care; 8 were in charge of engineers; 6 of the street commissioner; 5 of the city marshal; 4 of the water works superintendent; 1 of the marshal and street commissioner; 1 of the chairman of the sewer committee; 1 of the mayor; 1 of the city clerk. It was found to be too commonly the case that the man supposedly in charge of the plant already had too much municipal work assigned to him to do.



UNDERDRAIN CONSTRUCTION AT WOODWARD.
Four-inch farm tile was laid in trenches filled with gravel, five feet between centers. Filter sand was two feet deep.

The State Board of Health may render valuable service by preparing and publishing in bulletin form sample directions for the operation of certain plants, representative of general types. One plant differs from another, even of the same type, to such an extent that no one set of directions would apply generally. In order to illustrate what may be done in one actual case, the plant at the State Hospital and Colony for Epileptics at Woodward, Iowa, will be considered. This plant was designed by Lafayette Higgins, civil and sanitary engineer of the Iowa State Board of Health, and constructed in 1916 at a contract cost of $16,000 by the Des Moines Bridge & Iron Co., with the writer as superintendent of construction for the State.



VIEW OF IMHOFF TANK AT WOODWARD.
Imhoff tank in foreground, siphon chamber in background. Temporary plank walls through sedimentation chamber to provide for small flow when first operated. Water connections at right. At left of siphon chamber are seen two valve stems, one for by-pass gate, the other for flushing-out pipe.

To show how the operator may be assisted in understanding the parts of the tank which are ordinarily out of sight, an isometric drawing was prepared that shows quite clearly the important details of construction. If the photograph of the interior of the superstructure, with the photograph showing the method of constructing the drainage system of the filter and the isometric drawing of the Imhoff tank, is left framed at the plant, the operator will have little excuse for ignorance concerning the fundamentals of his job.

To assist the operator still further, a brief set of instructions should be prepared. The following directions will illustrate what might be done for this particular plant:

OPERATING SCHEDULE FOR THE SEWAGE TREATMENT PLANT, STATE HOSPITAL, WOODWARD, IOWA.

DAILY.

1. Visit the plant.
2. Give every part of the plant careful inspection.
3. Record the amount of sewage flow.
4. Fill out the report blank for the day.

(*Continued on page 301.*)

Municipal Journal

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Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

OPERATION OF SEWAGE TREATMENT PLANTS.

The discussion of the operation of sewage treatment plants in Iowa, the third installment of which appears in this week's issue, we consider an important addition to the literature of sewerage matters, especially in that it is derived from personal contact with a considerable number of small plants and the information so obtained has been made the basis of constructive criticism by one who is qualified to offer it. It is one of the most encouraging signs of the past few years that more attention is being paid to the operation of sewage treatment plants as distinguished from the theory of their performance and details of their construction. We believe that the series of articles by Francis E. Daniels on "Operation of Sewage Disposal Plants" that were published by Municipal Journal was among the first and we believe is still the most important of the contributions on the subject; but during the four years since these appeared, plant operation has assumed continually increasing importance in the writings of engineers and sanitarians.

A number of excellent suggestions for securing a more efficient and effective operation of sewage treatment plants are given by Prof. Dunlap in his paper, but one of these seems to us worth especial attention and adoption in some form or other. We refer to the recommendation that the engineer designing a sewage treatment plant should operate the same for one year after its completion. This idea has been advocated by us several times during the past few years, but Prof. Dunlap has added a suggestion which we do not recall having seen before, viz., that this operation be made compulsory by rulings of the state board of health. As he stated, engineers cannot afford to give careful supervision to plants designed by them for a year or any considerable part thereof without receiving some compensation therefor, and unless cities are required to pay the engineer for his supervision it is not probable that they will voluntarily contract with him for it. Making it compulsory to both the city and the engineer that a year's operation of the plant be made a part of the agreement for designing and constructing it, would seem to be about the only method of insuring such supervision, except in those cases where the engineer is able and willing to donate his own time and expenses, or in the exceptional cases in which the cities themselves are willing to pay for this supervision.

To any one who is familiar with sewage treatment plants, and the way in which they are usually run or are allowed to run themselves into total inutility, it must be apparent that operation under the control of an engineer would secure a vast improvement in results in a great majority of cases. The more common practice, especially among the smaller cities, is to turn the plant over to a street foreman or some other official who knows practically nothing about it and cares even less, with the inevitable result that the plant is no more successful than would be a farm which was plowed and seeded in the spring and then left with absolutely no attention throughout the remainder of the year. As a matter of fact, the results obtained from the farm would be proportionally much better than those to be expected from neglected or mismanaged sewage treatment plants.

SEWERS A WAR NECESSITY.

A few weeks ago we gave expression to and explanation of our opinion that the supreme duty of municipalities was to conserve the lives and health of their citizens. This was a general statement and its application was not carried into particulars. To a certain extent, the application must be left for each municipality to decide for itself. There are, however, certain lines along which such conservation must act which are common to practically all communities. One of the most important of these is that of sewers. In a recent letter to Municipal Journal, Surgeon-General Rupert Blue says: "The matter of better sewerage methods is one which has received full attention by this service (the Public Health Service), not only in those cities where our sanitary activities are being conducted, but also in the rural sections surrounding those communities. In fact, one of the most important phases of the work of the service has been in connection with the importance of improved sewage disposal methods. . . . No occasion has been neglected by officers of this service to impress upon the city authorities the importance of the establishment of water-carriage sewage disposal systems. In fact, one of the most prominent activities of the service in all the extra-cantonment zones has been in relation to sanitary engineering. . . . The importance of this matter cannot be over-estimated from sanitary and aesthetic standpoints."

There are a great many cities—more than many of us realize—in which a very considerable percentage of the residences are not connected with the sewers. In some cases, this is because the sewerage system has not been extended into all sections of the city; in other cases, it is because the city has not required property owners to connect their residences with the sewers that have been built. For instance, the commissioner of health of Milwaukee a few years ago reported 1,200 residences not connected with sewers, many because there were none available to them, while only a few days ago the Women's League of Philadelphia reported that scores of houses in one section of that city are on streets where there are no sewers, and the yards of some of these were in such unsanitary condition that they were a disgrace to a civilized community. In the smaller cities this condition is much more common.

That this condition is a cause of sickness and death there can be no question. Facts were brought out in an article in Municipal Journal for August 14, 1913, that showed that in Louisville, Ky., during the previous 30 years the increase in percentage of buildings connected to the sewer system from 15 per cent to 64 per cent had been accompanied by a decrease of almost exactly the same percentage, year by year, in the typhoid fever death rates. Last year the health department of Charleston, S. C., reported that it had caused 946 premises to be connected with the sewers during the previous year and that the typhoid death rate in that city was decreasing, asserting "As sewerage is put in and vaults filled up, so in proportion will typhoid diminish."

Typhoid has heretofore been the most dangerous enemy to be combatted by any army. The deaths among our soldiers from typhoid during the Spanish-American War were many times those caused by the enemy. Both knowledge of how to combat this disease and vigilance in doing so have increased greatly since that time, but every typhoid carrier that joins the army or every typhoid case in the vicinity of the cantonments introduces a possible center of infection for thousands of our boys. The danger is not only that infection will spread from communities in the vicinities of the cantonments, but any city in which there is typhoid is likely to send to the camp an unsuspected typhoid carrier, who, in spite of the greatest vigilance, may cause scores or hundreds of our soldiers to meet death in camp rather than on the battlefield where their deaths might be of service to the country.

The relation between drinking water and typhoid is pretty generally realized; but there are many who seem to be ignorant of the fact that there are at least two or three other sources of the disease which, where conditions are favorable, may be even more fatal than polluted water. Among these may be counted the absence of sewers. Of all public works in charge of city officials, the two which would seem to rank highest in importance are a water supply free from disease germs and the removal of sewage from every section of the city in a safe and sanitary manner. Where either of these conditions is already reasonably well provided for, the other must be ranked as the most important matter before the guardians of the public health and well-being.

SEWER PIPE OBTAINABLE.

Sewer pipe manufacturers, we are informed, have been given permission by the Fuel Administration to use, for the manufacture of such pipe, coal sufficient for fifty per cent of their average production for the past three years. While this is a very material curtailment over demands previous to the war, it is generally acceptable to the manufacturers, who believe that the need of the trade this year will not exceed this amount. (Incidentally, permission is granted to plants manufacturing drain-tiles to operate at full capacity on account of the demand for increased agricultural production.) The Fuel Administration will consider requests of individual manufacturers to increase their rate of production if they find that they cannot supply the demand in their respective territories.

The transportation of the sewer pipe is another factor which limited the output during the past few months, and may interfere with the prompt delivery of this material for some time to come. It is to be hoped, however, that where pipe is to be used for sewers for which a need already exists, the government will realize the importance to the health of the country of having these sewers built and will see that the transportation for the pipe is provided.

COUNCIL BUYS THRIFT STAMPS.

Municipal official bodies throughout the country are demonstrating in various ways their desire to do everything possible to assist the Government in its war program. One of the latest moves that has come to our notice is that of the City Council of Albert Lea, Minn. A few days ago the council members voted unanimously to invest their salaries for the past year in Thrift Stamps and Liberty Bonds, forming themselves into a "City Dad's War Saving Club." On learning this, the mayor, the city attorney, city assessor, and health officer, asked permission to join the club. All of these have, we understand, turned over their salaries for this purpose.

THE COST OF WIDE STREETS.

We wonder what the officials of the average town or small city would say to a proposition that they take care, free of charge, of the yards and private property generally for a width of 40 ft. back from the street line on both sides of the highway; one argument for this being that by so doing they could insure an up-keep of the land adjoining the street that would add to its appearance. We are in doubt whether any such proposition would carry in any city of the country.

Our attention has recently been called to a small city of Arizona, in which the streets are about 150 ft. wide, 100 ft. of this being set aside for a drive-way. The city is now in a quandary as to just what to do with this 100 ft., especially in view of the present high cost of paving materials and difficulty of obtaining them. The best advice that has been offered, apparently, is to pave out 30 ft. from each curb toward the center of the street, and develop the central 40 ft. as a park-way, enclosing this with a curb and planting it with trees and shrubs. "This," says the citizen recommending it, "would be an immediate saving of money and making Mesa a town of novel beauty."

Of this 150-foot street we do not believe that anyone experienced in city planning would suggest that, for a town of this size, there would be needed or desirable more than 40 ft. for roadway and 15 ft. for each sidewalk, or total of 70 ft. The remaining 80 feet are therefore of no service whatever so far as the use of the street for traffic is concerned, and its only value would appear to be as giving more open space for the houses abutting upon it. This 80 feet may therefore be considered as for the private benefit of the residents thereon. For instance, if the curbs of this street were not already set and shade trees planted, an alternative method would be to run a 40-foot roadway through the center of the street, leaving 55 feet on each side for sidewalk space. By omitting fences, as is now common practice, this entire 55 feet, with the exception of 10 to 15 feet paved sidewalk, would be to all intents and purposes a part of the front yards of the properties abutting thereon.

If this space is public property, it must presumably be maintained as such (almost certainly so, if it be placed as a parking in the center of the street instead of on the side); and therefore we have the condition sugested in the first paragraph—that property which is for the benefit of and might as well be owned by the property owners is improved and maintained at the expense of the city at large.

This is only one disadvantage of such unnecessarily wide highways. Another is that a given number of average-size building-lots are spread over twice as much territory as would be required if the streets were of only the width required by the reasonable demands of traffic, thus necessitating a greatly increased length of street and of the distance necessary to travel when passing from one part of the city to another. Considering that, in combination with this, the streets are approximately double the width that is necessary, we have the city confronted with the expense of improving and maintaining three times as much street area as would be necessary were the street widths reduced to those that are considered adequate and satisfactory by other communities.

OPERATION OF SEWAGE WORKS IN IOWA.

(*Continued from page 298.*)

WEEKLY.

1. Take samples of raw sewage and of tank effluent in the Imhoff conical glasses, and find the per cent removal of solids after 2 hours' settling. It should average 95 per cent.
2. Break up the scum in the gas vents with the hose.
3. Measure and record the depth of sludge in the sludge chamber.
4. Clean the inflow channels and the inlet and outlet weirs.
5. Skim the sedimentation chamber.
6. Squeegee the side walls, aprons and slot. (This may have to be done more or less frequently.)
7. Take a sample of the filter effluent for the methylene blue test for relative stability. When kept at a temperature of 68° F., the blue color should be retained for at least 10 days.
8. Operate all valves.
9. Turn water through the sludge grids for one minute.
10. Fill out report blank to date.

NEVER.

1. Never fill the tank with sewage when empty. Use water.
2. Never unnecessarily agitate the contents of the sedimentation chamber.
3. Never by-pass sewage either at the inlet or from the siphon chamber without recording the reason, date and duration, and notifying the State Board of Health within 24 hours.
4. Never run out large amounts of sludge at a time; better, small amounts every two to six weeks.
5. Never withdraw all the ripened sludge. Some should be left to seed the tank.
6. Never fill the sludge bed to a depth of more than 18 in.
7. Never allow the sludge in the chamber to rise closer to the slot than 2 ft.
8. Never stir the surface of the sand filters to a depth greater than ½ in.
9. Never allow the filter beds to stand flooded.
10. Never by-pass sewage directly to the underdrains by digging holes through the sand.
11. Never allow weeds and grass to clog the surface of the filters.
12. Never add new sand which has not been approved by the State Board of Health.

ALWAYS.

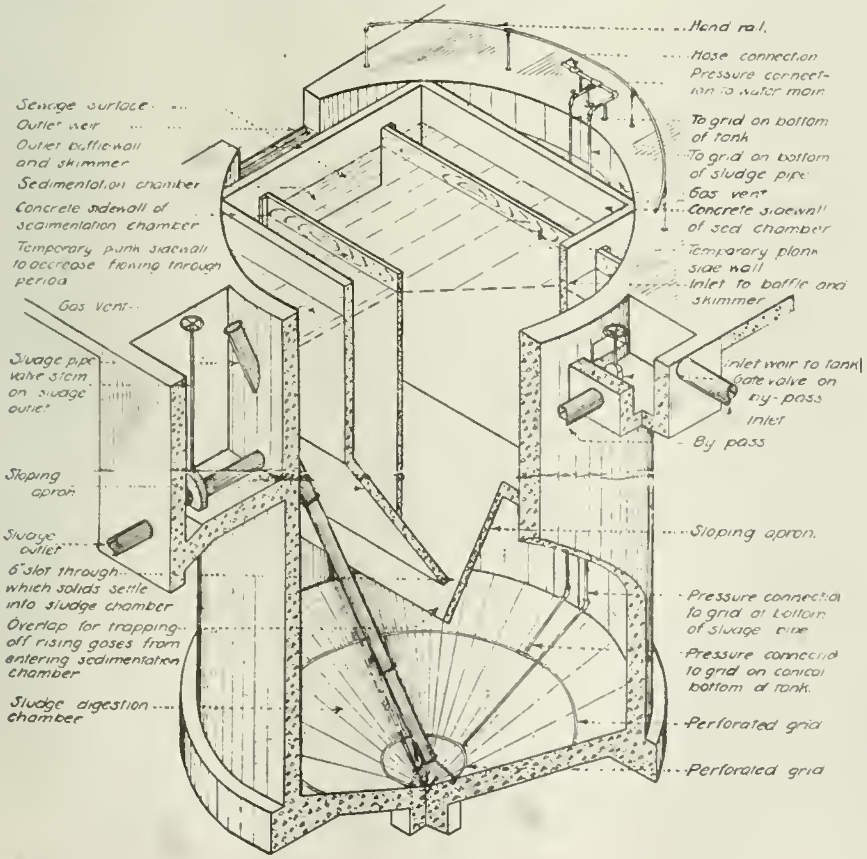
1. Always recollect that the business of this plant is to transform the organic matter in the sewage so that the final filter effluent will be clear and non-putrescible.
2. Always keep in mind that only about 1-3 of the total organic matter settles out in the Imhoff tank.
3. Always remember that the remaining 2-3 must be oxidized by bacterial action in the sludge beds into harmless mineral compounds.
4. Always back-fill the sludge pipe with water, and flush out the pipe running to the sludge bed, after withdrawing sludge.
5. Always clean the surface of the sludge bed before applying a new dose, and add more top sand if necessary.
6. Always make sure that there is enough room in the sludge chamber for the winter sludge.
7. Always note the distribution of sewage over the filters, and if uneven, correct it by re-leveling the beds or re-baffling the distributors.
8. Always keep the filter surface open by raking or harrowing to a depth not greater than ½ in. When this fails to prevent ponding, remove the upper ⅛ in. of sand and surface mat. Not more than 1 in. of sand should be removed in one year.
9. Always give the beds a thorough over-hauling in the late fall just before freezing weather. Pile up the dirty sand in small piles 6 to 8 in. high and 3 to 6 ft. apart. These piles will help support the ice.
10. Always watch for warm days in winter, when the surface of the filters may be put into good condition.

Third (to resume our remedies), it is probably true that final responsibility for the operation of our sewage treatment plants must rest with the State Board of Health. In some instances law suits have forced towns to operate their plants properly. Where no such pressure as this exists, some central authority must be in direct control. A bulletin setting forth, by photographs and by description, the principal facts concerning the operation of Iowa sewage treatment plants would be a real service. Another requirement ought to be regular reports upon blanks made out by the State Board of Health.

The Department of Health of the state of New Jersey has prepared space for the record for one month upon one sheet. In the third place, at least annual inspections should be made regularly of all sewage treatment plants in the state. More frequent inspections will be necessary where the monthly reports show poor results are being obtained.

Fourth, in order to make possible this additional supervision on the part of the State Board of Health, greatly increased financial support must be secured from the State Legislature. Time and again attempts have been made to secure adequate legislation to properly finance this work.

The writer cannot close this paper without acknowledging his indebtedness for the generous assistance so kindly extended to him over a period of several years by Lafayette Higgins, civil and sanitary engineer of the Iowa State Board of Health.


Hand rail.
Hose connection
Pressure connection to water main
To grid on bottom of tank
To grid on bottom of sludge pipe
Gas vent
Concrete sidewall of sed chamber
Temporary plank side wall
Inlet to baffle and skimmer
Inlet weir to tank
Gate valve on by-pass
Inlet
By pass
Sloping apron.
Pressure connection to grid at bottom of sludge pipe
Pressure connection to grid on conical bottom of tank.
Perforated grid
Perforated grid
Sewage surface
Outlet weir
Outlet baffle wall and skimmer
Sedimentation chamber
Concrete sidewall of sedimentation chamber
Temporary plank sidewall to decrease flowing through period
Gas vent
Sludge pipe valve stem on sludge outlet
Sloping apron
Sludge outlet
6" slot through which solids settle into sludge chamber
Overlap for trapping off rising gases from entering sedimentation chamber
Sludge digestion chamber

ISOMETRIC DRAWING OF IMHOFF TANK AT STATE HOSPITAL AT WOODWARD, IOWA.

The WEEK'S NEWS

State Highway Developments in Oregon and Virginia—United States in Campaign Against Respiratory Diseases—The Dubuque, Ia., Typhoid Epidemic—The New Intake Tunnel of Chicago—Big Calaveras Dam Collapses—Spokane Saves Money on New Street Lighting Contract—Navy Department Calls Philadelphia "Worst City" in Morals—Big Fire in Kansas City Manufacturing Section—City Manager Miller of St. Augustine Resigns—Garbage Disposal in St. Louis.

ROADS AND PAVEMENTS

Emergency Labor Hours on Highway Work.

Salem, Ore.—A. D. Kern, superintendent of construction work on the Columbia highway in Hood River county, has been directed by the highway commission to establish the 10-hour working day and to allow the laborers double time for the extra two hours. The reason for the order is that the improvement has been classed as emergency work. The commission is anxious to complete the work this year, and the fact that the men are constantly quitting work makes it necessary to put the projects in the emergency class. The projects affected are at Cascade Locks, Viento and Ruthton hill. With the pay allowed at double time rate the average daily wage will be about $4.50.

Legislation for Virginia Highways.

Richmond, Va.—State highway commissioner C. B. Scott is greatly pleased at the legislation recently passed by the General Assembly. He said that the needs of the department were fully met by the legislators and everything was provided for. The most important piece of legislation was the acceptance on the part of the legislature of the provisions of the federal aid road act. Together with the federal aid offered, $1,950,000 has been provided for use by the state department. The highway commissioner was also authorized to carry out all necessary plans for the improvement of the state highway. The legislature also adopted the state highway chain of roads, which will provide a connected set of roads through the principal parts of the state. The work of the department will be devoted first to the main arteries of the state, and small county roads will receive last attention. Three thousand five hundred miles of good roads will be provided throughout the state and work on these roads will be of a permanent nature. Another important bill passed was that designating automobile and other vehicle licenses for the upkeep of these roads. All the state convict labor will be put on the construction of the new roads. Heretofore about 1,200 convicts have worked on the roads, but the new law provides for the use of the entire convict force that has been working on the clothing contracts.

SEWERAGE AND SANITATION

Army Begins Campaign Against Respiratory Diseases.

Washington, D. C.—Respiratory diseases having caused practically all the sick and death rate in the nation's new armies, the Medical Corps has begun a nation-wide campaign of prevention against pneumonia, measles, diphtheria, mumps, meningitis, infantile paralysis, influenza and tuberculosis. All of the diseases mentioned are spread or communicated in the same way—through the transfer of nasal and mouth secretions. The sickness rate in camps throughout the country could be cut to the minimum if the soldiers and the general public as well stopped promiscuous coughing, sneezing, and spitting. The difficulty of controlling these diseases lies in the fundamental fact that human beings scatter their nose and mouth secretions without any consideration, despite rules and regulations to the contrary. An official statement says: "Unlike some disease germs, the germs which cause the diseases mentioned do not die or become harmless upon drying. So that when they are dried and blown about with the dust they are still capable of setting up disease in many other people. The problem of the respiratory diseases which confronts Surg. Gen. Gorgas and the Army Medical Corps is serious. Apparently, however, the public generally is totally ignorant of the immeasurable harm that is done through unguarded and promiscuous coughing, sneezing and spitting. Army Medical Corps experts, who have been given untiring study to this problem, have reached the conclusion that a national campaign must be inaugurated at once, not only in the camps, but in the homes, in the offices, in the street cars, and in all public places, to stamp out this widespread habit of spitting and coughing, if health conditions for our soldiers are to be improved." They feel that such a campaign is as important in every way for the object to be achieved as was the now famous and eminently successful fly-swatting campaign which started some years ago. For this reason the Surgeon General therefore appeals to the public to make the "Don't cough, don't sneeze, don't spit" slogan as widely quoted and effective as "Swat the fly." The Surgeon General appeals particularly to the press of the country to help with constant warnings, prominently displayed in their columns, in the form of articles and catch slogans that will serve as a reminder to the public that the health of our soldiers can be better safeguarded through vigilant cooperation in the anti-cough-and-spit campaign.

Typhoid Mixed With Politics.

Dubuque, Ia.—Those opposing the re-election of mayor Saul at the recent election charged that he attempted to withhold the report of the state health department on the subject of the typhoid epidemic until the campaign was over. Jack Hinman, Jr., water bacteriologist, signed, and Henry Albert, director, approved the report. The state investigation traced the epidemic to the city water supply and blamed the turning into the mains of unfiltered river water. The report says:

> "The water is derived from a tunnel known as 'The Level,' from a number of six-inch driven wells said to be from 60 to 100 feet in depth, one well eight feet in diameter and 100 feet deep and two artesian wells over 1,250 feet in depth. All of these wells are located at Eagle Point. There is in addition an artesian well 1,300 feet deep. There are also two six-inch suction lines running to the Mississippi river at a point about 400 feet off shore. There are three reservoirs and a stand pipe in use. One of the reservoirs located at the level is nearly fifty years old, but it is in apparent good condition. Another is located at Eagle Point while the third is located on the hills. There is also a standpipe which furnished the hills district and furnishes the pressure for the downtown high pressure system. All of these units are connected, but the water which is used in the stand pipe and the high pressure system is pumped from the level reservoir and contains, under ordinary conditions, a rather large proportion of water from the tunnel. The deficit is made up fom water pumped from Eagle Point. The new reservoir is used to float the low pressure system, any excess pumpage going into the reservoir when it is in use and any unusual demands being met by the water stored here.
>
> "An inquiry as to the source of the water supply used by the twenty-two reported cases of typhoid fever showed that tho most of these were supplied by the low pressure system, while two had not had city water in their home. I learned, however, that these two had been in the habit of drinking the city water at the places where they were employed. I examined the water from the wells which they used at home and found them in a satisfactory bacterial condition. One other private well was examined but it had not been used until after the outbreak. This well did not seem to be satisfactory. Except in the case of theso three wells thero were no other private wells in use among the families of those persons suffering from the disease. There were a few cisterns but in every case the water had not been used for drinking purposes before the outbreak of the epidemic."

"It would therefore seem, on the basis of this investigation, that so far as the water supply is concerned the city water is the only source which can be suspected.

"I learned from the water works men that during the months preceding February 1, more or less untreated water had been pumped into the city mains without any treatment whatsoever. This was most dangerous and in my opinion was the cause of the very serious contamination of your water supply. My recommendations on the basis of my examination and inspection are these:

"1. That no river water be pumped at any time without preliminary filtration or other sufficient treatment and that, in case of an emergency and consequent necessity to use the river water, the public be notified immediately by means of posters and newspaper notices and that they be warned to boil the water until bacterial examinations of water from the dead ends of the mains show that all contamination is removed. With regard to the purification of the river water I would warn you that chlorination of the turbid water, especially in winter time, is not considered satisfactory on the basis of experiment in other localities. The valves on the pipes leading to the river might well he sealed with a lead seal in such a manner that although the valve could be readily opened in a case of emergency the breaking of the seal would testify to the fact.

"2. That the water of the driven wells be not used in its present untreated condition, but that it be treated with calcium hypochlorite or preferably by liquid chlorine in an approved manner before being pumped into the system.

"3. The examination be made of the water from the other sources at frequent intervals, keeping particular watch on the water at 'The Level' since its variation in composition under different conditions is not well known.

"4. That the above mentioned examination be made by some competent local person and that they be supplemented by occasional more complete examinations made by the state laboratories.

"5. That in order to avoid difficulties with odors and tastes arising from the growth of algae in the large reservoir, this reservoir be provided with a cover so that light may be excluded and the gowth of algae be restrained.

Court Scores Health Board.

San Diego, Cal.—Directly criticising the methods of the San Diego health board, federal judge Oscar A. Trippit recently stated from the bench that it is un-American for any one in authority to hold a prisoner apart from counsel and he instructed an attorney to file habeas corpus papers in his court at once for the release of a woman prisoner. The charge was that of maintaining a disorderly house within five miles of a military post. Attorney for the defendant stated that he was not ready for trial as he had been refused the privilege of talking to his client. Shortly after her arrest the woman was released from federal custody on depositing a bail bond, but the municipal authorities of San Diego held her in jail or in hospital as a prisoner for treatment because of her physical condition revealed by Wasserman test. The local health board was not represented in court, but the attorney's statement of the board's refusal of his request for an interview went into the court record.

WATER SUPPLY

Chicago's New $4,550,000 Intake Tunnel Completed.

Chicago, Ill.—The city's new Wilson avenue water tunnel, the first important public improvement built by the municipality under the day labor plan, has been completed. Water will be turned into the great eight-mile bore, May 1. The tunnel cost $4,550,000. It has a horseshoe cross-section, one mile being 13 by 13 feet and the remainder 12 by 12 ft. The bore was constructed through solid rock and has a capacity of 300,000,000 gallons of water a day. It will supply three pumping stations in the northwest section of the city. The land end of the tunnel is at Mayfair, where a new pumping station is nearing completion. The bore extends under the lake three miles and connects with a large concrete intake crib. Work was started on the improvement in 1914 after bids submitted by various contractors had been rejected as excessive. The work was done by day labor under the Department of Public Works, except that a contract was let for the intake shaft and crib, as the city had not the special equipment required for this work in deep water. Day-labor construction of the tunnel was adopted on the recommendation of John E. Ericson, city engineer, and the work has been carried out under his direction. Henry W. Clausen, engineer of waterworks construction, had direct charge. Saving of about twenty per cent in time of construction is thought to have been effected by the introduction of an unusual method of delivering the tunnel rock directly to the concreting plant. Excavated rock was directly transferred from the heading to screening and pneumatic concreting plants traveling on a narrow-gage track in the tunnel. The 3-mile lake tunnel was driven from the shore shaft, with an average haul of 1½ miles. The rock required for the lining of this tunnel amounted to 47,520 cu. yd. This would have required 1,900 trains for transportation, which at the rate of 5 miles per hour would have taken 1,140 hours of work. The hoisting of these 47,520 cars of rock and the lowering of the aggregate would have required about nine months of working time. Adding to this the time saved by reduction of traffic and switching, it is estimated that a total saving of one year may be credited to this new method of working. The construction of the tunnel took exactly four years, from February, 1914, to February, 1918.

Commission Allows Increased City Water Rates.

Great Falls, Mont.—The rates charged by the municipal water plant here have been raised, the state utility commission at Helena having granted the application of the city for permission to make an increase. Commissioner J. H. Hall objected upon the grounds that an investigation should first be made to determine the amount of revenue the city is now deriving from the water department and to definitely ascertain if an increase is necessary. Flat rates are increased 20 cents with corresponding raises on other rates. Irrigation rates are increased from $2.50 to $3 a month. The ten per cent discount for prompt payment of bills before the tenth of the month is retained.

Big Water Supply Dam Goes Out.

San Francisco, Cal.—Work on San Francisco's new water supply in Calaveras valley was delayed a year, half a million dollars damage was done and the surrounding country narrowly escaped devastation when the big dam of the Spring Valley Water Company, seven miles back of Milpitas, near San Jose, went out. The slide was caused, engineers said, by the weight of the clay which is being used to ballast the center of the dam. But for the fact that the slide moved southward, the loss might have been much heavier. It was not the pressure of sixty feet of water in the reservoir which caused the slide, for the earth fell into the water, and not away from it. The dirt blocked the tunnel underneath and preventing a rush of water down on Sunol and the surrounding country to the north. Thirty-eight wagons and a section of the railroad used in the construction work went down among the debris. One-sixth of the total material piled into the dam slid away. The tower contained the mechanism for controlling the flow of water out of the reservoir and this was all wrecked. The dam is a quarter of a mile across the canyon and was 80 feet thick at the top. The top rolled away, leaving an L-shaped gap. The accident was witnessed by Alice Espy, the nine-year-old daughter of constructing engineer T. W. Espy. Being Sunday, the big gang of men employed on the dam was not at work, and because of this nobody was injured. According to John E. Behan, secretary of the Spring Valley Water company, there had been a number of slight indications of ground movement for several days, but nothing severe enough to cause the officials any anxiety. The final movement was rapid, taking place in about five minutes. Attention to the scene first attracted Alice Espy by the wabbling of the tower from side to side, resulting finally in it snapping off and falling as one piece into the lake. She called her father from the house and he saw the final shifting which resulted in the up-stream embankment slipping out. The work was planned to increase San Francisco's water supply and would have cost about $2,500,000. In addition to this the company purchased the entire valley, wrecking a number of homes and a school, and building a new county road. A 48-inch pipe line costing about $8,000,000 will conduct the water into San Francisco when the dam is finished. Calaveras valley was first favorably considered as a dam site in 1864 by Herman Schussler, because of its almost entirely enclosed character. It is a long narrow valley about 18 miles from San Jose and almost due east of Milpitas. The sides and bottom are practically impervious to percolation, a fact proved by three geologists, headed by Dr. J. C. Branner, who prior to construction on the dam, spent much time investigating the possibility of seepage. Four streams, Calaveras, Ysabel, Honda and Smith's creeks, form the chief water supply. Fifteen years of inspection through all the seasons were occupied in ascertaining definitely the guaranteed flow from these streams, and it was only after all these had been proved to the satisfaction of Spring Valley Water company engineers that the work of construction began. The first work was started about five years ago with the employment of T. W. Espy, present constructing engineer of the company. As many as seven hundred men have been employed at one time since then and the crew has never been less than three hundred. The valley is about seven miles long by a mile wide. On its northern end it narrows into a defile 1,300 feet wide and it is across this point that the dam was being erected to a height of 210 feet. The concrete tower, 235 feet in height, was to contain the mechanism for controlling the outflow of water. The reservoir covers 2,000 acres and has an impounding capacity of 60,000,000 gallons, with a yearly evaporation of not more than five feet over the entire surface. The project will cost $1,500,000. No cement has been used in the structure of the dam and it is said to be the largest of its kind in the world. Ninety-four carloads of concrete have been used, however, to build the drainage conduits.

STREET LIGHTING AND POWER

"Going Value" Not Subject to Taxation.

Trenton, N. J.—A decision has been handed down by justice Black in the state supreme court reducing the tax assessment of the Trenton & Mercer County Traction Corporation by $568,052. The State Board of Taxes and Assessments had held that this assessment on the "going value" of the company for 1916 was legal. In his opinion, judge Black decides that "going value" cannot legally be included in appraising public utility property for tax purposes. The judge held that "going value" is already taxed by a levy on the gross receipts of the corporation.

City Power Furnished to Harbor.

Los Angeles, Cal.—Funds have been provided by the city council for the complete distribution of municipal hydroelectric power at the harbor, by the purchase of $79,000 of the power bond issue of 1914 with sinking fund money. The skeleton of the system, including the high tension feed wires, has already been installed, but the money was lacking to put in the laterals and local distributing wires. The power department will expend $34,000 in extending the system to the fish harbor, and will use the balance of the $79,000 in gridironing the tidelands with service wires. Under a recent order of the mayor and harbor commission none but municipal electric power can be used at the harbor, and as the result it will be necessary to complete the distributing system at once to supply power to the numerous industries which will purchase from the city.

New Street Lighting Contract Cuts Costs.

Spokane, Wash.—Bringing to Spokane a very substantial reduction in street lighting costs and at the same time assuring the installation throughout the city of a greatly improved and much more efficient lighting system, the city council has ratified a contract drawn up on a ten-year basis with the Washington Water Power Company. The new contract is the first to be in operation between the city and the power company for several years. It provides for the replacement of about 1,400 old carbon arc lamps now in use with the latest gas-filled tungsten lamps at no extra cost to the city. The operating cost of the new lights will be $37 each per year, a reduction of $11 per light per year, under the present rate. This, it is figured, will afford the city a saving during the ten years covered by the contract of approximately $200,000. Installation of the new lamps, some of which are now used as an experiment on one street, where they have been fully proven, will begin on or before August 1, and all the old carbon arc lamps must be replaced by January 1, 1919. Mayor Fassett said: "The price for the new lights is lower than obtains in any other city, so far as I am informed. It is 25 per cent lower than is charged the city of Seattle by its own municipal plant. The saving in Spokane under the present price of $4 per month per lamp, amounts to over $15,000 per year at the present time, and, with the addition of new lights during the contract term, will probably make a saving of close to $200,000 during the 10 years. The right of the city to cancel the contract upon equitable terms in case a municipal lighting plant is built, is fully protected." It is provided in the new contract that the agreement may be terminated at any time by giving one year's notice, in the event that the city may wish to operate its own lighting plant. It is also provided that the company may replace the tungsten lamps with new and better ones, at its own expense.

Rates Increased Despite Franchise.

South Glens Falls, N. Y.—The state public service commission for the second district, in replying to a complaint of trustees of South Glens Falls against the United Gas. Electric Light & Fuel Company of Sandy Hill and Fort Edward on gas rates, declares that the condition in the franchise granted by the village is not controlling so as to prevent the commission from authorizing an increase in the rate in the event that the company can justify such increase on the ground that it is failing to earn a fair return upon the value of its property employed in the public service. From the record in this case it appears that the complainants do not propose to contest the increased rate if the decision is adverse to them. The complaint was dismissed.

FIRE AND POLICE

Officials Deny Philadelphia "Worst City" Morally.

Philadelphia, Pa.—"The police force is not only inefficient; it is corrupt; * * * in a time like this it would seem that our fighting forces are entitled to every protection against vicious influences which local authorities can provide. That such protection can be provided has been demonstrated to be practicable in municipalities in every part of the country. Philadelphia, alone among the large cities of the United States, has failed to meet the requirements of the War and Navy Departments in respect to this matter." This is from a statement on vice conditions in Philadelphia issued by Secretary of the Navy Daniels and Raymond B. Fosdick, chairman of the commission on training-camp activities. The city not only is alleged to be fostering vice to a greater extent than any other city in the country, but in the report "responsible city officials" are condemned for obstructing many attempts by Federal authorities to eliminate vice and are flatly accused of "intimacy with those who profit by the continued existence of vicious conditions." The report is the result of a nine weeks' investigation in Philadelphia. This inquiry was conducted by representatives of the commission on training-camp activities, in conjunction with agents of the Department of Justice. In spite of the fact that there are approximately four thousand men on the police force in Philadelphia, and in spite of the fact that they are empowered to close disorderly houses and place the proprietors and women under arrest, the report gives a list of sixty-two of these places in the heart of the city, which were open on March 14 and 15. It further states that this list constitutes only a small fraction of the total number of such establishments now being operated. Liquor is sold in a large majority of them, Mr. Fosdick continues in the report. Many admit men in uniform, and most of the houses situated in the negro section of South Philadelphia cater almost exclusively to sailors. "These houses are run so openly and our investigations have been so comprehensive and long extended, that I can state without hesitation that they enjoy police protection, for which money is paid to police officers." Moreover, the report continues, women ply the main streets of the city in large numbers, and do so by permission of policemen, who are accused of taking part of their earnings for protection. It is charged in the report that the police are in a financial conspiracy with men who act as walking directories for establishments. They are likewise accused of selling whisky to men in uniform, and licensed liquor dealers are alleged to be indifferent to the traffic. All efforts to arouse the city administration to a sense of its duty toward the situation, according to the report, have failed. Mr. Fosdick states that "it is hopeless to expect any real improvement until the Navy Department takes drastic action to protect men in the service while on liberty in Philadelphia." The report continues: "Reports of our investigators contain instance after instance of action on the part of police officers which has prevented the enforcement of the law against this evil. In virtually every house visited they were informed by the women that they paid weekly sums to the police for protection and that liquor could be purchased in the house. Women on the streets stated that the payment of a weekly sum to the police was necessary to escape arrest."

Basing their wholesale denials on the fact that a number of the addresses given in the federal report are incorrect, city officials and commercial organizations have protested loudly against the charges. Councils adopted a resolution asking the Philadelphia congressmen to demand a congressional inquiry into the Fosdick vice report. The municipal committee of the United Business Men's Association pledged itself to the creation of a metropolitan police force here and urged the mayor and the police department to purge every section of the city of vice. The wartime commission of the Interchurch Federation issued a statement in which it said a survey of the situation here conducted by its agents confirmed the belief that judges and magistrates were lax in the enforcement of the laws and that policemen profited from vice while certain politicians protected it. Mayor Smith and Frank L. Garbarino, special agent of the Bureau of Investigation of the Department of Justice, both toured the central vice zone. They said they found everything "closed" and the streets free from disorderly women. Director Wilson, superintendent Robinson, Charles Lee, head of the vice squad; captain of detectives Tate and division and district commanders held a special conference at City Hall, in which the mayor's orders to keep the city clean were issued. Probation officers of municipal court declared vice has increased 100 per cent. in city, as disclosed in their records of arrest for the last year. The mayor's promise to keep the lid down on the city came after he had personally inspected certain sections of the central police districts. He went in company with Alfred J. Souder, head of his private gambling squad, and Charles Lee, who commands the vice squad. "The streets, I found," he said, "were remarkably free from women who prey on the uniformed man. This is exactly as it should be. The authorities at Washington have maligned and disgraced the city with a report which is not justified, and there is just one way to answer this injustice—keep this city so clean that the rest of the country will have to sit up and take notice. And this is my ambition. Vice is not going to be tolerated in Philadelphia. It must go and stay away. I have formed my own program and it is going ahead as outlined."

Fire Sweeps Manufacturing Section.

Kansas City, Mo.—The fire which destroyed about three city blocks in the wholesale and manufacturing district in the western section of the city, entailing a heavy financial loss, was of incendiary origin, according to James E. Marvin, fire warden. He added, however, that no clew had been found to establish the theory definitely. He placed the loss at between $2,000,000 and $2,500,000. "I grew suspicious when it was called to my attention that the fire had burned 'against the wind,'" Marvin declared. "Almost as soon as the fire was discovered other fires began to break out in adjacent buildings. That would indicate the fires were deliberately started as they were not situated so that sparks from the first fire could have been thrown upon them." Several of the larger warehouses in the vicinity of the fire area contained food. The fire caused many explosions of chemicals and made fire-fighting dangerous. Buildings housing 18 large wholesale and manufacturing firms were destroyed. One fireman was caught under a falling wall and three others were also injured. It developed that the warehouse of the Abernathy Furniture company, where the fire originated, had been locked most of the day and that there had been no employes there for several hours.

Power Plant Wrecked by Fire.

Massillon, O.—A $300,000 fire in early morning wrecked a portion of the plant of the Massillon Electric & Gas Co. completely disabling the machinery. Massillon was left without electric power, a number of plants being idle, throwing several thousand men out of work. Several nearby towns supplied with power from here were also industrially idle and in darkness. The fire was caused by an explosion in the oiling system at the switchboard, it is believed. In addition to industrial plants here being closed down and the town in darkness, Wooster, Dalton, Brewster, Canal Fulton and Navarre, towns receiving power from the local plant, were similarly affected. Firemen had narrow escapes from injuries by falling walls. The company was not able to supply a large number of industries for two days. The generators, turbines and boilers were uninjured.

Vote for Two-Platoon System.

Sioux City, Ia.—Sixteen new men are to be added to the Sioux City fire department immediately, and firemen will only be required to remain on duty 11 hours during the day, or 13 hours at night, according to the decision of the voters at the recent election. The proposition carried by a large majority. The vote on this proposition was light. Many of the ballots were returned unmarked. In some of the downtown precincts the sentiment against the proposed increase showed its greatest strength. A movement to procure the double platoon system was inaugurated by the firemen about two months ago. Their first request was that an ordinance providing for this change be passed by the city council. Later a petition was presented asking for this action by the council or that the matter be submitted to the voters of the city. The council decided to submit the question as a special issue.

GOVERNMENT AND FINANCE

St. Augustine's Manager Resigns.

St. Augustine, Fla.—Eugene Masters, former mayor of St. Augustine, and the first to fill the office of city manager, although temporarily, has been appointed by the city commission to the position of city manager to succeed Winton L. Miller, resigned. When the city manager plan was adopted by the people of St. Augustine in 1915 and before newly-elected commissioners could locate and decide on a permanent city manager, Eugene Masters occupied the position.

Former manager Miller submitted a report on the accomplishments of the city manager administration from July 17, 1915, to March 31, 1918. Some of the achievements mentioned in the report are:

> "Most notable of the achievements of your commission during the past two and three-quarter years is the fact that you have held rigidly and consistently to the policy of withholding the making of expensive improvements until there could be developed a definite city plan, comprehending not only the treatment of St. Augustine from the standpoint of beautification and attractiveness to the thousands of annual winter visitors as well as the residents, but including also the utilitarian features. And this policy has been adhered to, notwithstanding the clamor from some sources for so-called permanent improvements, which at best could have been but temporary if such building was to have been haphazard, as must needs have been the case in the absence of a plan comprehending all of the immediate construction needs of the community.
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> "In this connection, of the most far-reaching importance is the preparation of the St. Augustine city plan, under the charge of the City Plan Board, by the American Park Builders, of Chicago. Not until these plans are laid before the electorate for adoption will the full advantage and vast significance to the future development and welfare of the community be appreciated, and even then much energy must be expended in the campaign of publicity in order to gain a full measure of realization of the vast importance and great value of this city plan.
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> "As a part of this plan, the studies of and development of complete plans for the extension and betterment of the water

supply, pumping and distributing facilities, and of the sanitary sewer system for the entire city are of immense value, and from the standpoint of a construction program must be undertaken first.

"These two plans, that dealing with the waterworks, by Seabury Gould Pollard, of Cincinnati, and the sanitary sewer design by Alvord and Burdick, of Chicago, are now complete and await only the opportune time for the financing of the construction work proposed.

"Of next greatest importance has been the placing of the city's affairs upon a sound financial basis. Falling gradually behind each year the city had developed to a point where it was a case of government by deficit, and this was leading the city treasury into certain bankruptcy. This policy was at once changed by your commission to a pay-as-you-go policy with the result that the city has not only lived within its income annually but has made a substantial beginning on a sinking fund to retire the $65,000 waterworks bonds at maturity, in addition to reducing a current debt or floating debt of more than $35,000 to $11,000 at the beginning of this year. And during the coming month one-half of this balance will be paid off and the remaining half can be taken up by funds in the sinking fund, to be repaid to the sinking fund in 1918, with interest at 4 per cent. That your financial policy has been sound is best evidenced by the fact that your administration was successful in reducing the interest rate on the current debt 50 per cent., or from 8 and 7 per cent. to 4 per cent.

"Equalization of property values for taxable purposes, one of the first things to receive your attention, has been most successful and of immense importance to all property owners. Changing of tax values ranging from 18 to 70 per cent. of actual values up to full cash or 100 per cent. valuation, and which resulted in a change of the tax roll from $2,005,553 in the first part of 1915 to approximately $10,000,000 in 1916 with a reduction in the tax levy from 30 to 7 mills, was a most important undertaking, and the full value of the equalization will not be realized, perhaps, until special improvement assessments are levied in the future.

"The cleaning of the force-main from the pumping station to the main portion of the city, supplying water for both domestic and fire protection purposes, the capacity of the main having been reduced from 10-inch to 7-inch, due to incrustation, resulted in increasing the flow from 900 gallons to 1,778 gallons per minute, a reduction of 30 per cent. in fuel cost and better fire protection.

"Centralized purchasing of all supplies has always resulted in material savings, although with the constant advancement of prices on all commodities it is difficult to show percentages saved. The ever-increasing cost of all materials and supplies used by the city, like everything which goes into the private business and home, urges a continuation of the most careful buying methods.

"The marsh land survey shows the city as owner of a vast amount of acreage which should be reclaimed when opportune, making provision for additional park space, and also building sites.

"The policy, early inaugurated by your commission, of providing only groceries and fuel actually needed by the indigent of the city has almost eliminated pauperism, as it existed here in the past, which was due largely to the giving of money rather than supplies. Those heretofore thinking themselves dependent upon charity have found themselves, in many instances, able to take care of themselves, and in this they have not only bettered themselves but the community.

"The latter part of 1917 witnessed the city undertaking the sanitary collection service, so as to provide more direct and careful control and supervision, to protect further the public health.

"Ever directing its attention to the matter of providing increased fire protection, especially in co-operation with the Fire Underwriters' Association, with a view not only of keeping down the fire losses, but keeping the city on a first-class rating basis, and reducing or holding down insurance rates, the city by placing the service forces in the fire department in January of this year was able to build up much better protection without adding to the number of men employed in the two departments thus combined. That this change has been for the betterment of the service is best evidenced by the excellent work of the fire department since the first of this year.

"The financial control inaugurated by your administration in keeping with an up-to-date budget system has resulted in an improved method of reporting and recording the financial transactions of the municipality. This will be best brought out in the coming audit, which is certain to show the books in excellent shape, and which will bring out also, I believe, that even our classification of accounts is in almost accurate check with the system devised by the state comptroller, judging from the classification outlined in the state reports for municipalities."

Milwaukee Votes Against Small Aldermanic Board.

Milwaukee, Wis.—By a substantial majority the voters disapproved of the proposal to reduce the common council to a body consisting of six aldermen-at-large and twelve district aldermen, all aldermen to be divided into two groups, each group to be elected for four-year terms at alternate biennial elections. This plan was backed by civic organizations. The voters decided in favor of the plan to have the common council consist of 25 ward aldermen only, elected every four years. Seven bond issues were approved by good majorities, including $200,000 for rebuilding the Sixteenth street viaduct; $350,000 for harbor improvements; $500,000 for new school buildings, additions and sites; $350,000 for two new bridges across the Milwaukee river; $75,000 for public bath houses and $250,000 for a central police station.

Manager Plan Defeated.

Lansing, Mich.—The voters at the recent general election disapproved of the plan to name a charter commission to prepare and submit a new basic law draft, which was to provide for a commission-manager government, by a vote of 2,803 to 2,187, a majority of 616. An amendment to the charter to permit bonding for purchase of public utilities by the city was defeated. The gas and steam-heating plants were particularly aimed at in this. A proposition to return to the old charter in making the mayor's appointments of board members subject to confirmation by the city council was approved.

STREET CLEANING AND REFUSE DISPOSAL

Garbage Collectors Strike.

Trenton, N. J.—After a three-day strike by all the garbage collection employees of the city, the men returned. The 24 men were displeased because two of their number were summoned to police court for disregarding rules and dumping garbage and ashes on a vacant lot. During the strike trucks tried to make collections on the principal streets south of the creek. Residents of other sections of the city were asked by superintendent McClain to remove their garbage and ashes from the sidewalks until collections could be resumed. The strike was ended when the two men were discharged by the judge and they all returned to work.

City Must Renew Garbage Disposal Contract.

St. Louis, Mo.—The Public Service Board decided that the city must renew the garbage reduction contract with the Indiana Reduction Company, for a period of at least two years, before it expires in September. The board is desirous of avoiding a public letting, at which irresponsible and experimental bidders may submit offers for the short-term contract. The Indiana Company is the only one that has successfully reduced the city garbage in the past twenty years without creating a public nuisance, and even it has been the object of many complaints at intervals. The city garbage contractors who established reduction plants at Sands Station, opposite St. Charles, Mo., and Stallings, Ill., were forced by the county courts to close the plants as nuisances. The hog colony on Chesley Island was a constant nuisance to Kimmswick, Mo., and other localities in the vicinity. The service board does not want to let a ten-year contract to the Indiana company because the city administration plans to operate a municipal reduction plant as soon as possible. The Indiana company has agreed to sell its plant near Dupo, Ill., to the city for $336,000, which its officers say is the exact cost of construction five years ago when material was cheaper. The service board a year ago recommended that the city build a new plant within the city limits under the Cobwell patented system, at an estimated expense of $700,000. The city has started a ninety-day experiment with the chemical reduction process patented by Dr. Joseph M. Hirsh of Chicago. An experimental plant has been erected. Dr. Hirsh has agreed to produce salable by-products, from a supply of twenty tons daily of green garbage, that will yield the city more than $3.75 per ton revenue at an expense of not more than 10 cents per ton in chemicals. Director Talbert has recommended to the Service Board that the present high price of grease and fertilizer will compel the city to pay close to $10 a ton for the green garbage to the Indiana Reduction company. The Indiana company recently informed the Service Board that it will co-operate by furnishing the twenty tons of garbage for the daily test, but will ask the city to pay it the approximate value of the by-products in the garbage, about $9 a ton. Grease is now worth 12 cents a pound and fertilizer yields about $20 a ton. It will cost the city about $200 a day to conduct the experiment, Talbert says, and the Hirsh method will have to produce more than three times the stipulated value of by-products to enable the city to break even on the experiment.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Bituminous.

Bituminous Foundations for Streets and Highways. Advantages of this construction set forth. By L. Kirschbraun. 2 ills., 1,700 words. American City. March. 40 cts.

Relative Efficiency in Methods of Repairs to Bituminous Macadam and Bituminous Concrete Pavements. Paper before American Assn. for Advancement of Science by Geo. H. Biles. 5 ills., 4,500 words. Better Roads & Streets. March. 20 cts.

Efficiency of the Application of Bituminous Materials for Surface Treatments on Gravel and Broken Stone Roads. Paper before Amer. Assn. for the Advancement of Science. By Julius Adler. 2,500 words. Engineering & Contracting. March 6. 15 cts.

Recent Developments in the Construction of Bituminous and Concrete Pavements. Abstract of paper before Amer. Road Builders' Assn. by Chas. M. Upham. 3,500 words. Engineering & Contracting. March 6. 15 cts.

New Features in Bituminous Pavement Practice. Summary of recent development throughout the country. No changes in basic methods. Improvements in methods and materials. By Chas. M. Upham. 3,500 words. Municipal Journal. March 9. 10 cts.

New Features in the Design and Construction of Bituminous Roads and Treatment of Concrete Roads. By Chas. M. Upham. A paper before Amer. Road Builders' Assn. 3,000 words. Canadian Engineer. March 14. 15 cts.

Bituminous Pavements Adaptable to Various Conditions, with Special Reference to Type and Thickness. By L. Kirschbraun. 2 ills., 3,300 words. Municipal Engineering. March. 30 cts.

Bituminous Pavement Foundations. A letter from Geo. C. Warren, recommending their use under bituminous surfaces. 2 ills., 1,400 words. Municipal Journal. March 16. 10 cts.

Brick.

Brick Pavements. A reply to statements of Arthur H. Helder in his article on "Pavements," in the January number of New Jersey Municipalities. Bv Maurice B. Greenough. 1,800 words. New Jersey Municipalities. March. 25 cts.

New Features in Brick, Wood Block and Stone Block Pavements. Paper before Amer. Road Builders' Assn. By Clifford Older. 3,000 words. Good Roads. March 16. 15 cts.

Concrete.

Concrete Roads for Trucks. General discussion of this type of pavement. 6 ills., 3,000 words. Commercial Vehicle. March 1. 25 cts.

Cost of Constructing Concrete Pavement at Savannah, Ga. Itemized cost of 31,500 sq. yds. laid by city. 500 words. Engineering & Contracting. March 6. 15 cts.

Adopt Belting and Rolling Methods for Concrete Roads. District engineers of Illinois Highway Dept. find differences in practice due to local conditions. By H. E. Bilger. 1,000 words. Engineering News-Record. March 7. 20 cts.

Granite Block.

Present Status of Granite Block Pavements. Paper before the American Assn. for the Advancement of Science. By Clarence D. Pollock. 2,800 words. Better Roads & Streets. March. 20 cts.

Repaving Central Park Transverse Roads. Reclipped granite blocks and cement concrete repaving on heavy traffic roads in New York City. By D. B. Goodsell. 7 ills., 1,500 words. Good Roads. March 16. 15 cts.

Gravel.

The Maintenance of Gravel Roads. Paper before Amer. Assn. of State Highway Officials. By Paul D. Sargent. 1 ill. 2.500 words. Better Roads & Streets. March. 20 cts.

Wood Block.

Causes of Expansion Trouble in Wood Block Pavements in Texas Cities. Result of investigation by C. H. Teesdale, of the Forest Products Laboratory. 4 ills., 1,800 words. Engineering & Contracting. March 6. 15 cts.

Oil for Creosoting Wood Paving Blocks. The Chicago specifications and the injunction suit to prevent their use. Aim to secure unadulterated coal tar distillate. 1,500 words. Municipal Journal. March 30. 10 cts.

Wood Block Pavement on Washington Boulevard. Swelling of blocks and bulging therefrom after several years of service. Author believes character of oil used was responsible. By Chas. C. Brown. 2 ills., 1,700 words. Municipal Journal. March 23. 10 cts.

Foundations.

Substantial Road Foundations Necessary. From a paper before County Commissioners' Assn. by Herbert M. Sharp. 1,000 words. Better Roads & Streets. March. 20 cts.

Drainage.

Improper Drainage the Cause of Most Highway Failures. No hard surface should be constructed until entire road has been under constant maintenance long enough to indicate weak spots. By A. A. Young. 4 ills., 4,000 words. Engineering News-Record. March 21. 20 cts.

Subsurface Water and its Relation to Pavement Troubles. Paper before Indiana Road School by J. L. Harrison of U. S. Office of Public Roads. 3,000 words. Engineering & Contracting. March 6. 15 cts.

Engineering.

Importance of Trained Road Engineers. Speech before Kentucky Road Engineers. By Tom Wallace. 3,000 words. Southern Good Roads. March. 15 cts.

The Ethics of Highway Engineering. Paper before Road Institute of Univ. of North Carolina. By W. C. Riddick. 3,000 words. Good Roads. March 30. 15 cts.

Miscellaneous.

Abandoned Railroad Grade for a Highway. Use of D. L. & W. Railroad right of way is urged. 2 ills., 300 words. Good Roads. March 23. 15 cts.

Construction and Maintenance of Highways Under War Conditions. Paper before the Amer. Assn. for the Advancement of Science. 1,500 words. By Arthur H. Blanchard. Good Roads. March 2. 15 cts.

Highway Problems Considered Under Ten Main Heads. Bond limitations, better drainage, lower grades, traffic study, better types, load limits, safety factors, adequate maintenance, laboratory control and opportunities. From lecture before Road School of Michigan Univ. By H. Eltinge Breed. 1 ill., 5,000 words. Engineering News -Record. March 28. 20 cts.

War Department Favors Road Construction. Statements by Major Gens. W. M. Black and Leonard Wood. 500 words. Municipal Journal. March 9. 10 cts.

Preliminary Work on Provincial Highways. Draining, ditching and examination of bridges. By Geo. Hogarth. 3 ills., 2,000 words. Canadian Engineer. March 14. 15 cts.

Methods of Constructing Roads at Northeastern Cantonments of National Army. Paper before Amer. Road Builders' Assn. by Philip P. Sharples of the Barrett Co. 4 ills., 2,000 words. Engineering & Contracting. March 6. 15 cts.

Methods of Constructing Wagon Roads in Alaska. Permanently frozen material, ice deposits and other unusual problems encountered and methods adopted. 2.200 words. Engineering & Contracting. March 6. 15 cts.

Roads in the Hudson River District with Unusual Construction Features. Description of work by the Palisades Interstate Park Comm. and the New York State Comm. of Highways on the Henry Hudson Drive, the Storm King Road and roadways in the Palisades Interstate Park. Paper before the Amer. Road Builders' Assn. By W. A. Welch. 3,000 words. Good Roads. March 9. 15 cts.

The Highways of the South. Brief statements of work done by southern states during the winter. By Katherine Clemens Gould. 3 ills., 1,800 words. Southern Good Roads. March. 15 cts.

Maintenance.

Maintenance of Earth Roads. Paper before Assn. of State Highway Officials. By John H. Mullen. 4 ills., 2,800 words. Better Roads & Streets. March. 20 cts.

Care in Highway Maintenance. Smoothness of British roads reported by W. V. Sohier. 700 words. Stone. March. 25 cts.

Road Maintenance in Virginia. Paper before Virginia Good Roads Convention. By S. L. VonGemmingen. 2,500 words. Southern Good Roads. March. 15 cts.

Contracts.

Equitable Highway Contracts. Would benefit both parties thereto. Overlooked elements of cost in highway contracting. Classification of materials. Meeting war-time conditions. 3,000 words. Municipal Journal. March 23. 10 cts.

Road Laws.

New Road Laws in Kentucky. 1918 general assembly passes laws for the maintenance of highways, for regulating loads and for making various other changes in the road law of the State. 4,000 words. Good Roads. March 30. 15 cts.

Traffic Regulations in Relation to Road Construction and Maintenance. Paper before Amer. Road Builders' Assn. By W. A. McLean, Deputy Minister of Highways, Ontario. 500 words. Municipal World. March. 15 cts.

Accounting.

Uniform Road Accounting. Essentials of workable system and a description of that used in Wayne Co. concrete road work. By Edw. N. Hines. 2,400 words. Good Roads. March 23. 15 cts.

City Streets.

Street Intersection Signs. Discussion by members of the League of California Municipalities. 800 words. Pacific Municipalities. March. 30 cts.

Dangerous "Safety" Islands. Accidents caused by low visibility of lamp posts and poor shape of islands. Plan proposed for minimizing danger. By G. S. Eaton. 3 ills., 1,000 words. Municipal Journal. March 16. 10 cts.

Elimination of Grade Crossings. Relative advantages of cuts and embankments. Each crossing forms special study. Paper read at conference of Co. Road Supts. By E. R. Blackwell. 4 ills., 1,400 words. Canadian Engineer. March 7. 15 cts.

Laying Utility Mains in Advance of Pavement Construction. Result of an inquiry into methods employed by various cities made by Franklin D. Howell, chief engineer of Board of Public Utilities of Los Angeles. 1,200 words. Engineering & Contracting. March 6. 15 cts.

SEWERAGE AND SANITATION.

Sewerage Terms.

Standard Sewerage Terms and Uniform Definitions. Comment on terms recommended by Amer. Pub. Health Assn. 700 words. Municipal Journal. March 16. 10 cts.

Sewerage Terms. Recommended for adoption as standard by committee of American Public Health Assn. Includes sewerage and sewage disposal. 3,500 words. Municipal Journal. March 16. 10 cts.

Sewerage Designing.

Considerations Affecting the Choice Between the Separate and Combined Sewer Systems. By Paul E. Green. 800 words. Municipal Engineering. March. 30 cts.

Maximum Rainfall Rates. Analysis of rainfall in Philadelphia. 1 ill., 500 words. Municipal Journal. March 23. 10 cts.

Estimating Sewage Flow from Floor Area. Used in districts where day or temporary occupants of buildings exceed residents. Methods of measuring sewage flow. 1,800 words. Municipal Journal. March 30. 10 cts.

Sewer Construction.

Sewer Construction in Tunnel at Hartford, Conn. Method of running tunnel through clay for 1,100 feet. 2 ills., 1,200 words. Engineering & Contracting. March 13. 15 cts.

Difficult Sewer Construction by Sanitary District of Chicago. Brief description of several pieces of work. 600 words. Engineering & Contracting. March 13. 15 cts.

Enlarging Brick Sewer with Concrete. Capacity doubled by raising roof of 11-foot brick sewer. 2 ills., 200 words. Concrete. March. 25 cts.

Construction Plant and Methods Employed on Recent Important Sewerage Work in Illinois. Description of work on sanitary canal, in Chicago, and at Camp Grant. 5 ills., 1,600 words. Municipal Engineering. March. 30 cts.

Sewer Pipe Joints. Materials and methods used by various cities. From discussion by Boston Soc. of Civil Engineers. 1½ pages. Canadian Engineer. March 7. 15 cts.

Reconstructing a Sewer in Tunnel. Enlargement of old 11-foot conduit beneath 50-foot embankment carrying canal. Invert also changed. 1 ill., 800 words. Engineering News-Record. March 28. 20 cts.

Sewer Mains.

Small Sewer Siphon Under Low Head Has Not Clogged. By J. H. Putnam, city engineer, Hattiesburg, Miss. 500 words. Engineering News-Record. March 21. 20 cts.

Outfall Sewer of Poor Concrete Pipe Disintegrates. Cement in section exposed to septic tank gases crumbles after pipe had been in service only two years. By H. L. Sherman. 2 ills., 800 words. Engineering News-Record, March 14. 20 cts.

Service Strength of Sewer Pipe. Standard methods for testing strength of pipe to resist pressure from backfilling sand, two-point and three-point bearings. 1 ill., 1,500 words. Municipal Journal. March 2. 10 cts.

Settlement of Pipe Sewers. May be caused by weight of back-filling and thus occasion leaky joints. 1,000 words. Municipal Journal. March 2. 10 cts.

Sewage Treatment.

Treatment of Sewage by the Activated Sludge Process. Part III. Handling the sludge. 2 ills., 3,300 words. American City. March. 40 cts.

Some Characteristic Design Features of the Northeast Sewage Treatment Works at Philadelphia. Refers to 32 Imhoff tanks. By W. L. Stevenson. 1 ill., 1,000 words. Municipal Engineering. March. 30 cts.

Experiences in Six Years' Operation of Imhoff Tanks. Abstract of paper before New Jersey Sewage Works Assn. describing operation of Madison-Chatham Sewage Disposal Plant. By Paul Molitor. 2,200 words. Engineering & Contracting. March 13. 15 cts.

Disinfection in Philadelphia. Use of liquid chlorine at Pennypack creek sewage treatment plant. 400 words. Municipal Journal. March 16. 10 cts.

Sewage Sludge to be Utilized. Drying beds at Canton sewage works will be cleaned by contractor and sludge disposed of without cost to city. By R. Winthrop Pratt. 800 words. Engineering News-Record. March 14. 20 cts.

Sewage Treatment and Disposal. Discussion of modern methods and sludge utilization. By G. Bertram Kershaw. 3,000 words. Canadian Engineer. March 21. 15 cts.

The Operation of Small Sewage Disposal Plants. Paper before New Jersey Sewage Works Assn. By Geo. W. Fuller. 4,000 words. Canadian Engineer. March 14. 15 cts.

Operation of Sewage Works in Iowa. Conditions found by author at thirty-nine plants. Inefficient operations due to lack of funds, ignorance and carelessness. Sedimentation, septic and Imhoff tanks, sand filters, sprinkling filters and contact beds. By J. H. Dunlap. 5 ills., 2,700 words. Municipal Journal. March 30. 10 cts.

Operating Small Sewage Disposal Plants. Features peculiar to small plants. Recommendations for operation of Imhoff tanks. Foaming, scum prevention and removal. From a paper by Geo. W. Fuller. 2,700 words. Municipal Journal. March 9. 10 cts.

Harbor Pollution.

Sewage Pollution of Boston Harbor. Report of state commission shows gradual increase. Acid treatment of sewage not recommended, chiefly for financial reasons. 2,600 words. Municipal Journal. March 23. 10 cts.

Sanitation.

The Supreme War Conservation. Necessity for municipal sanitation. 500 words. Municipal Journal. March 9. 10 cts.

WATER SUPPLY.

Dams and Reservoirs.

High Multiple-Arch Concrete Dam for Salt Lake City Water-Supply. Washed gravel and sand from excavation used in mixture. Wood forms built in small panels. Cost $100 per acre-foot of storage. 5 ills., 1,700 words. Engineering News-Record. March 7. 20 cts.

Maintaining Reservoirs in Tropical Countries. How reservoirs of the Canal Zone water supply are protected from pollution by trees and undergrowth, grass, aquatic plants, and microscopic organisms. Stagnation and putrefaction in reservoirs. 3 ills., 3,000 words. Municipal Journal. March 9. 10 cts.

Light Equipment Builds Big Reservoir. Brief description of Highland Park reservoir, Michigan. 5 ills., 300 words. Concrete. March. 25 cts.

Cost of Grass Cutting at Impounding Reservoirs, Panama Canal Zone. Itemized costs by month. 1 ill., 1,100 words. Engineering & Contracting. March 13. 15 cts.

Design and Construction of Reinforced Concrete Covered Reservoir. Structure built at Mankato, Minn., in 1916. By H. F. Blomquist. 2,800 words. Engineering & Cement World. March 1. 15 cts.

Results Obtainable in the Use of Concrete in Water Tank Construction. Description of several types of concrete water tanks. By C. C. Whitaker. 9 ills., 2,000 words. Municipal Engineering. March. 30 cts.

40,000-Gallon Concrete Tank Built for $3,100. For the village of New Trier, Minn. 3 ills., 1,500 words. Concrete. March. 25 cts.

Pumping.

Electrification of Lancaster Water Works. Old steam plant built in 1836 gradually replaced by more modern apparatus. New electric plant has twenty-one million gallons high-duty capacity. Description of new equipment. By John T. Brainard. 4 ills., 1,500 words. Municipal Journal. March 16. 10 cts.

Water Pumping by Electric Power. Discussion of characteristics of motor-driven pumps and suggestions for selection of pumps for municipal water pumping. Paper read before Ohio Central-Station Men. By R. L. Yates. 5 ills., 4,000 words. Electrical Review. March 16. 30 cts.

Water-Pumping by Electric Power. Second part of article discussing characteristics of motor-driven pumps and giving suggestions for selection of pumps for municipal water pumping. By R. L. Yates. 5 ills., 2,800 words. Electrical Review. March 23. 30 cts.

Thawing Pipes.

Thawing Services at Lawrence, Kan. Description by supt. of water works of method employed last winter. 700 words. Municipal Journal. March 30. 10 cts.

Thawing Frozen Water Mains. Method of using electricity at North Attleboro for thawing pipes varying in size from small service pipes to six-inch mains. By Wm. Plattner. 2 ills., 1,500 words. Municipal Journal. March 2. 10 cts.

Thawing Frozen Water Pipes by Electricity. How work was done in Passaic, N. J., and general instructions. By Mathew King and Wm. R. Bryans. 2 ills., 1,500 words. Power. March 26. 10 cts.

Thawing Water Pipes by Electricity. Method and apparatus described. By H. D. Rothwell. 4 ills., 1,200 words. Canadian Engineer. March 21. 15 cts.

Conduits.

Lead Wool. Description of use of this material. By R. J. Thomas. 2,000 words. Journal, American Water Works Assn. March. $1.00.

Small By-pass Carried Water Supply After Submerged Break. Braced wood plug reducers between 15½ and 6-inch steel pipe carry 133 pounds pressure. Only 20 per cent capacity reduction. By H. A. Rands. 1 ill., 700 words. Engineering News-Record. March 7. 20 cts.

Leaks from High-Pressure Fire Service Mains. Detailed description of tests on such mains in borough of Manhattan. By Henry B. Machen. 1 ill., 2,100 words. Journal, American Water Works Assn. Marco. $1.00.

Leakage from Vitrified Pipe used to Convey Water Under a Low Head. Description of tests made by New York Water Department on 18-inch pipe with different kinds of joints. By Wm. W. Brush. 3 ills., 4,000 words. Journal, American Water Works Assn. March. $1.00.

Reinforced Concrete Flumes Poured in 100-foot Lengths. Hub and spigot expansion joints in six irrigation conduits totaling a mile in length have done their work for two years. 3 ills., 700 words. Engineering News-Record. March 21. 20 cts.

St. Louis' New Concrete Water Conduit. Provided to supplement old. Methods of mixing, placing and reinforcing concrete. Creek crossings supported on piles. Equipment used. Contract prices. By W. E. Hardenburg. 3 ills., 3,000 words. Municipal Journal. March 2. 10 cts.

Hydraulic Sluicing for Blanketing Porous Canal Banks. Employed in U. S. Reclamation Service. 1,600 words. Engineering & Contracting. March 20. 15 cts.

Purification.

Coagulation Plant of the Bismarck Water Supply Company. Brief description from report of Alvord & Burdick, engineers. 1,000 words. Fire & Water Engineering. March 6. 15 cts.

Differentiation of Bacteria of the Colon-Aerogenes Family. Result of experiments by the author in distinguishing between them. By Wm. Mansfield Clark. 4,500 words. Journal, American Water Works Assn. March. $1.00.

Chlorination and Chloramine. Description of experiments and results in the use of sodium chloride, caustic potash, sulphuric acid, carbonic acid, sodium carbonate, and sodium bicarbonate on the destruction of B. coli in water. By Jos. Race. 8,000 words. Journal, American Water Works Assn. March. $1.00.

Chlorination at San Diego. Liquid chlorine entirely eliminates colon bacillus from water supply. No typhoid traceable to supply. Difficulties experienced in applying chlorine to water supply and methods of overcoming them. By Wilbur H. Judy. 2 ills., 1,500 words. Municipal Journal. March 23. 10 cts.

Health Board Orders Water Company to Install Filters. Decision of California state board in connection with Los Banos Water Co. 500 words. Engineering News-Record. March 7. 20 cts.

Results of the Chlorination of Public Water Supplies in Michigan. By Ed. W. Rich, State Sanitary Engineer. 1,700 words. Municipal Engineering. March. 30 cts.

Filter Alums Used in Ontario. Analyses in several cities show need of enforcing standard specifications. By G. E Gallinger, A. V. DeLaporte and F. A. Dallyn. 2,800 words. Canadian Engineer. March 21. 15 cts.

Water Filtration Plant at St. Hyacinthe, P. Q. Four units each of one million gallons daily capacity. Central location of office facilitates supervision and operation of plant. Improvements of fire service. By Fred. Elbert Field. 8 ills., 2,800 words. Canadian Engineer. March 11. 15 cts.

Characteristics of a Lime Softening Filtration Plant. Result of experience at the Grand Rapids, Mich., Filtration Plant. By Walter A. Sperry, Chief Chemist. 2 ills., 1,500 words. American City. March. 40 cts.

Reduction of Free Carbonic Acid in Settled Water Increases Length of Filter Runs at Panama. Experiences with three plants told by Geo. C. Bunker, Physiologist for the Canal Zone. 2 ills., 2,300 words. Engineering & Contracting. March 13. 15 cts.

Water Supply Standards and Their Improvement. Statement of standards adopted by several states and the Treasury Department, with comments by the author and discussion by five others. By Wm. J. Orchard. 6,000 words. Journal, American Water Works Assn. March. $1.00.

Waste.

What Becomes of the Water Pumped in Chicago? Discussion of conditions and probable loss by leakage by Chicago Bureau of Public Efficiency. 3,000 words. Engineering & Contracting. March 13. 15 cts.

Popular Objections to Water Metering and How to Overcome Them. Discussion of this subject from a report by

Chicago Bureau of Public Efficiency. 1,700 words. Engineering & Contracting. March 13. 15 cts.

Measures Adopted to Curtail Water Consumption in the City of St. Louis. By Ed. E. Wall, Water Commr. 1,500 words. Municipal Engineering. March. 30 cts.

Legal and Commercial.

Supervision of Public Water Supplies by the Health Officer. General discussion from sanitary point of view. By Jack J. Hinman, Jr. 2,300 words. Canadian Engineer. March 7. 15 cts.

Important Ruling of the Massachusetts Supreme Court on Haverhill Water Regulations. By Albert L. Sawyer. 1,600 words. Fire & Water Engineering. March 27. 15 cts.

Pennsylvania Water Rate Decision. Public Service Comm. supreme in matters of judgment. Ground water, parallel mains, going value, bond discount, reproduction and book costs involved. Municipalities win in Ohio Valley Water Co. Suit. By Farley Gannett. 2,800 words. Engineering News-Record. March 28. 20 cts.

Miscellaneous.

New York Section of American Water Works Assn. Meets. Account of meeting of February 20th. 2,500 words. Fire & Water Engineering. March 6. 15 cts.

New York City's Catskill Mountain Water Supply. Brief comprehensive description by the deputy chief engineer of the department. 31 ills., 7,000 words. Journal of the Engineers' Club of Philadelphia. March. 40 cts.

Annual Report of the Kalispell Water Department. 1,500 words. Fire & Water Engineering. March 20. 15 cts.

STREET LIGHTING AND POWER.

Lighting.

Street Lighting in 1917. Review of developments in the art and practice. Illustrations from more than twenty cities in all sections of the country. 2,000 words. Municipal Journal. March 2. 10 cts.

Modern Electric Street Lighting. Discussion of incandescent and arc lamps from the standpoint of illumination. By S. L. E. Rose & H. E. Butler. 14 ills., 2,400 words. American City. March. 40 cts.

Chicago's New Parkway Lighting System. Method of running circuits and use of series-multiple transformers with special couplings. 1 ill., 600 words. Electrical World. March 9. 15 cts.

An Electrically Illuminated Fountain. Construction and wiring features of a noteworthy installation. New field for outdoor lighting. By A. L. Powell. 7 ills., 2,000 words. Electrical Review. March 30. 30 cts.

Distribution Lines.

Design of Underground Distribution for Electric Light and Power System. Complete analysis of method of preparing a design. By G. J. Newton. 28 ills., 25,000 words. Proceedings of Electrical Engineers. March. $1.00.

Gas Main Suspended Over River. Temporary construction at Tacoma, Wash., where bridge was washed away. 2 ills., 200 words. The Gas Age. March 1. 25 cts.

Power Plants.

New Station No. 5 of the Rochester Railway & Light Co. Hydro-electric generating station of 32,000 horsepower operated to carry the peak loads of combined system. By P. B. Findley. 5 ills., 2,000 words. Electrical Review. March 23. 30 cts.

Output of Large Generating Systems. Great growth in use of central-station energy shown by returns from forty-seven companies in United States and Canada. Increase more than 4,000,000,000 Kw.-Hr. for year. 600 words and table. Electrical World. March 23. 15 cts.

Logic of Public Utility Consolidations. Both physical and fiscal combinations are economical of investment and operating cost and a public benefit. Statistics of progress. Centralized power production. By Clarence E. Fowler. 2,800 words. Electrical World. March 23. 15 cts.

Economies in Central-Station Meter Testing and Repairing. A description of the methods used by the Los Angeles Power Bureau embodying many noteworthy features. By C. W. Geiger. 5 ills., 2,000 words. Electrical Review. March 2. 30 cts.

Interconnection of Electrical Plants in Massachusetts. Spreading rapidly and recognized as an economic movement of great importance. 1,500 words. Electrical World. March 2. 15 cts.

Trend of Public Utility Interconnection. Nation-wide movement toward interconnected generating and transmission systems. 5,000 words. Electrical Review. March 9. 30 cts.

Rates.

Three-Charge System the Highest Development in Public Utility Rate Making. Paper before Illinois Gas Assn. By J. M. Spitzglass. 3,500 words. American Gas Engineering Journal. March 23. 10 cents.

Power Production in War Times. How the cost of coal has gone up and its quality has gone down. Problems of coal delivery and station operation which the power superintendent has to face. Possible economies suggested. By Walter C. Slade. 3,000 words. Electric Railway Journal. March 23. 15 cts.

The Public Utilities and the War. Utilities forming important part in war program while contending with very large increases in operating costs. Need for relief through higher rate schedules. By Chas. W. McKay. 4,000 words. Electrical Review. March 30. 30 cts.

Rates for Public Utilities Service. Paper before Illinois Gas Assn. by J. M. Spitzglass. 4,000 words. Gas Age. April 1. 25 cts.

Miscellaneous.

Girls as Meter Readers. Used in Pueblo, Colo., for reading electric meters, and found more accurate than men. 1 ill., 500 words. Electrical World. March 16. 15 cts.

FIRE AND POLICE.

Fire.

Fire Equipment Statistics. Figures showing fire apparatus, both motor-driven and horse-drawn, in service and reserve in the cities of the United States and Canada of 5,000 population and over. 8 pages. Fireman's Herald. March 2. 10 cts.

Training Firemen for Service. Special training necessary to make efficient firemen. Use of apparatus, physical drill, administration, fire prevention among subjects to be taught. 1,700 words. Municipal Journal. March 16. 10 cts.

Social Aspect of Fire Loss. Discusses personal responsibility for fire loss. 2,500 words. Fire Protection. March. 20 cts.

Police.

Motorcycle Police Sub-stations. Description of a new Detroit police booth. 1 ill., 200 words. Municipal Journal. March 2. 10 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Refuse.

Improved Waste Collection and Disposal Recommended. Three-separation plan for Baltimore. Garbage reduction, rubbish utilization and incineration, ashes for filling. By Walter E. Lee. 1,300 words. Engineering News-Record. March 14. 20 cts.

Refuse Disposal. General consideration; paper before Western Soc. of Engineers. By Rudolph Hering. 2,800 words. Canadian Engineer. March 14. 15 cts.

Recommended Garbage and Rubbish Disposal Methods for Baltimore, Md. As proposed by Walter E. Lee. 1,000 words. Engineering & Contracting. March 13. 15 cts.

Garbage.

Garbage Collection in Chicago. Qualities desired in cans and wagons. Practice in Chicago. Water carriage of garbage. Keep handling at a minimum. 1,000 words. Municipal Journal. March 16. 10 cts.

New York City Has Largest and Best Garbage Reduction Works. Plant with capacity of 1,500 tons a day cuts hand labor to minimum by use of 38 separate conveyors, dehydration, degreasing and tankage drying all done as single process in 199 air-tight reducers. By H. V. Schiefer. 12 ills., 3,000 words. Engineering News-Record. March 21. 20 cts.

Garbage Utilization at Home. Suggests chicken raising by private families. 300 words. Municipal Journal. March 9. 10 cts.

Feeding City Garbage to Hogs. Information and instructions furnished by the U. S. Depart. of Agriculture. Feeding garbage, diseases of pigs and plant layout. 1 ill., 2,200 words. Municipal Journal. March 9. 10 cts.

Garbage Disposal in Columbus. Decreased amount of garbage and decrease of fats in same due to food economizing reduce income from reduction plant. Detail cost of operating plant. Recovering alcohol from garbage. 1,000 words. Municipal Journal. March 30. 10 cts.

Snow Removal.

Methods of Handling Snow Removal Work in Pennsylvania. By Geo. H. Biles. 1 ill., 700 words. Better Roads & Streets. March. 20 cts.

Motor Trucks for Snow Removal Superior to Teams. Discussion before Western Soc. of Engrs. 2,500 words. Engineering News-Record. March 28. 20 cts.

Remove Snow from New York Highways. Recommendation by New York Highway Traffic Assn. or state legislation. 500 words. Municipal Journal. March 9. 10 cts.

Prepare for Next Winter's Snows. Recommends providing in budget and otherwise for removing snows from highways. 600 words. Municipal Journal. March 16. 10 cts.

Keeping Connecticut Roads Open. Description of snow removal work. 1 ill., 500 words. Municipal Journal. March 9. 10 cts.

Methods of Handling Snow Removal Work on Highways in Pennsylvania. By Geo. H. Biles. 800 words. Engineering & Contracting. March 6. 15 cts.

MOTOR VEHICLES.

The South and the Motorist. Popular article. By Geo. W. Sutton, Jr. 1 ill., 1,600 words. Southern Good Roads. March. 15 cts.

Jitneys in Los Angeles Losing. Report of Bd. of Public Utilities shows unprofitable operation on car-mile basis. Many complaints from public. 1 ill., 700 words. Electric Railway Journal. March 9. 15 cts.

Motor Truck Efficiency. Recommendation of standard method of calculating on basis of cost per ton-mile. Effect of road upon efficiency. 700 words. Municipal Journal. March 2. 10 cts.

Motor Truck Parcel Post. Trial trip of 180 miles demonstrates feasibility of hauling mail over highways. Fourth assistant postmaster general describes results of operation at Truck Club dinner. 1 ill., 1,400 words. Good Roads. March 30. 15 cts.

Possibilities of Truck Transportation. Comparison of service rendered by trucks and railroads. 700 words. Municipal Journal. March 2. 10 cts.

Return Loads in Connecticut. Statewide organization for stimulating motor truck freight hauling for short hauls and as feeders for water, trolley and railway lines. 900 words. Municipal Journal. March 16. 10 cts.

Connecticut Establishes First Statewide Return Loads Bureau. Operation of the plan described. 8 ills., 3,000 words. By Joseph Husson. Commercial Vehicle. March 1. 25 cts.

GOVERNMENT AND FINANCE.

City Managers.

City Managers and Their Salaries. A list of all known cities having city managers, with populations, name of manager, when the present incumbent was appointed, and salary paid. Prepared by Harrison G. Otis, Secy.-Treas. of the City Managers' Assn. 1¼ pages. Municipal Journal. March 30. 10 cts.

City Manager Plan, with Proportional Representation for Kalamazoo. By Harry H. Freeman. 700 words. American City. March. 40 cts.

Finance.

Nine Months' Experience with New Jersey's Municipal Finance Laws. Paper before New Jersey State League of Municipalities. By Walter R. Darby. 3,000 words. New Jersey Municipalities. March. 25 cts.

Accounting for Interest and Taxes. Discussion from water department point of view. By W. W. Brush and 5 others. 1,400 words. Journal, American Water Works Assn. March. $1.00.

Miscellaneous.

A Council's Business System. Requirements of Canadian law and suggested system for municipal councils. 3,000 words. Municipal World. March. 15 cts.

The City's Part in the Development and Control of Public Utilities. Paper before convention of New Jersey State League of Municipalities. By Delos F. Wilcox. 5,500 words. New Jersey Municipalities. March. 25 cts.

How Municipal Officials May Assist the Fuel Administration. 1 ill., 1,000 words. American City. March. 40 cts.

Constructive Publicity as an Ally to the City in Securing Good Municipal Ad-

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

April 15, 16.—SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Annual convention, Galveston, Tex. Secretary, H. S. Cooper, Dallas, Tex.

April 15-17.—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-19.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

April 18-20.—SOUTHWESTERN SOCIETY OF ENGINEERS. Annual convention, Douglas, Bisbee and Tucson, Ariz. Secretary, C. E. Barglebaugh, El Paso, Tex.

April 23-24.—LEVEE AND DRAINAGE CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Conference, St. Louis, Mo. Secretary-treasurer, C. S. Gannon, 421 National Bank of Commerce Bldg., St. Louis, Mo.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

April 26, 27.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary. J. P. Lichtenberger, University of Pennsylvania, Philadelphia.

May 7-9.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 7-10.—CANADIAN GOOD ROADS ASSOCIATION. Annual road congress. Secretary, George A. McNamee, 909 New Birks Bldg., Montreal, Que.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 14.—AMERICAN ASSOCIATION OF ENGINEERS. Fourth annual convention, Chicago, Ill. Secretary, A. H. Krom, 29 South LaSalle St., Chicago.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Goss, 315 Plymouth Court, Chicago, Ill.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, Roanoke, Va.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers will be held on Thursday morning, June 6, at the Worcester Polytechnic Institute at Worcester, Mass. "Fuel Economy" will be the vital theme of the meeting. Discussion is requested on the following topics: What are the economic effects of impurities in coal? To what extent is fuel oil likely to be used as a substitute for coal? How can soft coal be burned without smoke in marine boilers? What are the possibilities in the direction of the utilization of anthracite wastes? What instruments are useful and desirable in the boiler room as aids in saving coal? What is essential to the economical operation of hand-fired boiler furnaces when using soft coal? To what kinds of plants and coals are the different types of mechanical stokers respectively adapted and what is the limiting factor to their use in the small plants? What experience have you had in the use of wood as fuel? To what extent is wood available as fuel? What coal economies can be effected in residence heating? What coal economies can be effected in small steam plants? What experiences have you had with the storage of coal? While the above topics are all that can be suggested for discussion, additional short papers on any fuel topic are requested for publication. Items of interest on fuel performance should be sent to the secretary of the association.

American Society of Civil Engineers.

The American Society of Civil Engineers has decided again to abandon its annual convention. The reasons given for this action are the absence of many members in the service of the country, the inappropriateness of social functions at this time, the limitation of transportation facilities and the advisability of economy along all lines.

Canadian Society of Civil Engineers.

Fuel and power problems in Canada were the subject of discussion of the recent professional meeting of the Canadian Society of Civil Engineers, held in Toronto. About 150 attended. Special emphasis was laid by the speakers upon the need of developing Canada's fuel resources.

The opening address was delivered by Sir William Hearst, Premier of Ontario, who reviewed the action taken by the provincial government to relieve the fuel shortage and promote the development of the peat industry. B. F. Haanel, chief of the fuel division of the Canadian department of mines, delivered a thorough address embodying estimates of the peat and coal resources and dealing with processes for preparing peat and lignite for fuel.

Transportation was discussed by W. N. Neil, secretary of the Canadian Railway Association, who described the difficulties the railways had to contend with in connection with fuel shortage and the great economics already effected. W. J. Dick, mining engineer of the commission of conservation, urged that the area served from the coal fields of western Canada could be considerably enlarged by special railway rates, and suggested a pooling of interests by the mines to secure more of the division of fuels of the Mines economic development. John Blizard, Department, described the process of producing a commercial fuel from peat. E. Stansfield, of the mines branch, dealt with the briquetting of bituminous coals.

The addresses delivered on the second day dealt principally with the development of water powers to provide hydro-electric power as a substitute for coal. Among those who treated of this question were J. B. Challies, of the Department of the Interior; J. M. Murphy, chief electrical engineer of the Department of Railways, and P. H. Mitchell, Toronto. Albert Grigg, deputy minister of lands and forests for Ontario, spoke of what the province was doing to supply wood fuel.

National Electric Light Association.

The National Electric Light Association will hold another war convention this year, the meeting to take the form of a serious business session, at which many of the important problems confronting utility companies will be discussed.

(*Continued on page* 311)

PERSONALS

The twentieth anniversary of the firm of Burns & McDonnell, consulting engineers of Kansas City, Mo., was celebrated April 1. Besides the original members of the firm, C. S. Burns and R. E. McDonnell, they have associated with them as members of the firm Captain C. A. Smith, R. L. Baldwin, L. B. Reynolds and C. F. Lambert. The firm will continue to specialize in municipal engineering and appraisal work.

Smith, Chester A., member of the American Society of Civil Engineers, and associate member of the firm of Burns & McDonnell, consulting engineers of Kansas City, Mo., has accepted the appointment as captain in the Sanitary Corps of the National Army and has reported for service at Fort Oglethorpe, Georgia, his work being under the department of the Surgeon-General of the National Army. Captain Smith is 36 years of age, is a graduate of Kansas State university, and has been nine years with the firm of Burns & McDonnell, consulting engineers, in which work he has had extensive experience in water works and sanitation.

The following officials have been elected:

Waterloo, Ia.—Mayor, R. C. Thompson; engineer, W. D. Johnston; river front commissioner, R. A. Ellis; park commissioner, R. Leffler.

Keokuk, Ia.—Mayor, Ed. S. Lofton; commissioners, T. J. Hickey and D. J. Hemmy.

Sioux City, Ia.—Mayor, Rev. Wallace M. Short.

Des Moines, Ia.—Mayor, Thomas Fairweather.

Cedar Rapids, Ia.—Mayor, J. F. Rall.

Burlington, Ia.—Mayor, James M. Bell.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant, but it is believed that pipe manufacturers will soon meet to decide on new prices. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A, $1 extra.

The Layne & Bowler Co., Memphis, Tenn., has just issued a striking 64-page bulletin dealing with "Railway Water Supply." The subject of screens for wells is taken up with interesting and convincing detail and the different types made by the company are described and their advantages for various purposes enumerated. The work of Layne and Bowler as developers of ground work supplies is described and the guarantee contracts discussed. Another section takes up the Layne vertical turbine pumps, their construction, operation and interesting installations. Useful information in the last section includes hydraulic tables, handy data on derricks, pipe and casing. The book is a splendid example of beautiful printing, both in typography and illustration. Every point and type of equipment is clearly pictured with photograph and diagram. The book, which should be on the desk of all interested in water supply for railways, is for general distribution.

The International Motor Company, New York, N. Y., has issued a number of attractive bulletins discussing the various types of Mack trucks and illustrating the variety of service they are giving. One set of bulletins describes the model "AC" 3½, 5½ and 7½-ton trucks and another set the model "AB" 1, 1½ and 2-ton machines. Full specifications and descriptions of parts are presented, together with innumerable illustrations of machines, making an impressive display of Mack service.

The American-La France Fire Engine Co., Elmira, N. Y., has recently received the following orders: Baltimore, Md.—2 type 14 chasses, 1 type 20 combination chassis, 1 type 12 piston pump engine, 2 type 75 piston pump engine; Casper, Wyo.—1 type 12 combination with junior pump; Cheyenne, Wyo.—1 type 31 truck tractor, 1 type 40 combination; Dubuque, Ia.—1 type 31 75-ft. aerial truck; Fresno, Cal.—1 type 14 combination service truck; Hampstead, Md.—1 type 40 combination with junior pump; Martinsburg, W. Va.—1 type 12 pumping engine; Miles, Mont.—1 type 40 combination chemical engine and hose car; Mishawaka, Ind.—1 type 40 combination chemical engine and hose car; Mount Pleasant, Ia.—1 type 40 combination chemical engine and hose car; Muskegon, Mich.—1 type 75 pumping engine, 1 type 17 4-truck tractor; Seymour, Conn.—1 type 75 pumping engine; United States Government—Tuberculosis Hospital, Otisville, N. Y., type 10 pumping engine; Clearing Hospital, Rose Bank, S. I., N. Y., 1 type 75 pumping engine; General Hospital No. 3, Rahway, N. J., 1 type 75 pumping engine; Watervliet Arsenal, Watervliet, N. Y., 1 type 75 pumping engine; Waterbury, Conn.—1 type 75 pumping engine, 2 type 33 service trucks; Wheeling, W. Va.—1 type 12 pumping engine, 2 type 75 pumping engine, 1 type 14 combination service truck; White Plains, N. Y.—1 type 75 pumping engine; Windber, Pa.—1 type 75 pumping engine, 1 type 75 combination with junior pump.

Government Prices on Ore, Coke and Steel.

The Council of National Defense has authorized the following statement: "The President has approved the recommendation of the price-fixing committee of the War Industries Board that the maximum prices heretofore fixed by the President upon the recommendation of the board upon ore, coke, steel, and steel products, subject to revision on April 1, 1918, be continued in effect until July 1, 1918; from April 1 to July 1, however, the maximum price of basic pig iron be reduced from $33 to $32 per gross ton, and that the maximum price of scrap steel be reduced from $30 to $29 per gross ton. No new contracts calling for delivery of any of said commodities or articles on or after July 1, 1918, are to specify a price unless coupled with a clause making the price subject to revision by any authorized United States Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime.

"It is expected that all manufacturers and producers will observe the maximum prices now fixed."

The Asbestos Protected Metal Company, Pittsburgh, Pa., announces the appointment of Herbert Longstaff as manager of its St. Louis office, located in the Boatman's Bank building.

Belgian Firm Wants Machinery Catalogues.—A Belgian colonial firm wishes to receive catalogues from American manufacturers of mining machinery (rails, ore cars, tools, furnaces, motors, pumps, etc.), hydraulic mining machinery (nozzles, monitors, gravel pumps, ejectors, sluices, etc.), hydroelectric machinery (water turbines, dynamos and electric wiring for transmission of power), motor trucks and tractors. The Belgian firm understands that under existing circumstances it may be difficult to quote prices, according to a statement made to the Bureau of Foreign and Domestic Commerce by the Belgian consul-general at Chicago, but desires to study American designs, reserving the question of price for such time as orders may be placed. It would find last year's catalogues satisfactory. The name of the firm may be obtained from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. (Refer to file No. 8325.)

American Fire Apparatus in Japan.—An evidence of the international reputation of American-made motor fire apparatus is apparent in the recent shipment of three motor hose cars to Japan by the American-La France Company. All three units were mounted on Goodyear cushion fire-truck tires.

NEWS OF THE SOCIETIES

(*Continued from page 310*)

Sessions will be held on two days. The place of meeting has not yet been decided, although it is assured that some point in the Middle West, outside of Chicago, will be selected. No decision has been reached regarding date of the meeting except that it will be some time between May 15 and June 15, depending on accommodations that can be secured.

Walter Neumuller, of the New York Edison Company, has been appointed chairman of the convention committee. Announcement has been made that there will be no entertainment features, and no inducements will be offered ladies to attend.

Engineers' and Architects' Club of Louisville.

The March meeting of the Engineers and Architects' Club of Louisville was held on the 19th. The following papers were read: "The Road Situation in Kentucky," Rodman Wiley, state commissioner of roads; "The Relation of Traffic to the Type of Road," W. F. Brooks, U. S. senior highway engineer; "Selection of Type of Road to Build," R. C. Heath, road engineer, Dept. of Public Roads of Kentucky (formerly with Massachusetts highway commission).

Indiana Sanitary and Water Supply Association.

The eleventh annual convention of the Indiana Sanitary and Water Supply Association opened March 26 at the Claypool Hotel, Indianapolis, with about one hundred engineers and health officers from various parts of the state attending.

Dr. W. F. King, assistant state health commissioner, president of the association, said in his annual address that the organization has been largely responsible for many of the improvements made in water supply conditions in Indiana during the last ten years. The association, he said, has been one of the important factors in procuring legislation looking toward the purification of water supply, fire prevention, the regulation of public utilities by a commission and flood prevention.

There was a round-table discussion on the subject of "Proper Installation and Care of Meters and Services." The members of the association were guests of the Indianapolis Water Company at a buffet luncheon at the company's Riverside plant at noon, where a short talk was given by George L. Mackintosh, president of Wabash College.

The program for the afternoon session included the reading of papers by W. H. Durbin, engineer of the Indianapolis sanitary commission; Philip Burgess, of Columbus, O.; George W. Bach, member of the war service commission of the American Boiler Manufacturing Association, and L. D. Grisbaum, of Indianapolis.

A vigorous appeal that nothing be permitted to interfere with the installation of a sewage disposal plant in Indianapolis was made by Dr. J. N. Hurty, secretary of the state board of health at the second day's meeting. Dr. Hurty's remarks followed the reading of a paper, entitled "Sewage Disposal for Indianapolis," by George W. Fuller, a consulting engineer of New York, and expert adviser for the sanitary commission of Indianapolis. Mr. Fuller explained the proposed plan under which the plant would be operated. Dr. Hurty said he had been informed recently that an organized effort is under way in Indianapolis to kill the effectiveness of the sanitary commission law by amending it at the next session of the legislature. It was Dr. Hurty's opinion that any movement of this kind should be fought to a finish.

Difficulties which many filtration plants have encountered in getting alum and chlorine caused the meeting to pass resolutions asking that the authorities give these articles a priority rating. Many times, it was declared, chlorine has had to be shipped by express from Niagara Falls to Indianapolis, and the Terre Haute plant found it necessary to get alum the same way from Joliet, Ill. The chemical company at the latter point has found it extremely difficult at times to get cars in which to load bauxite at its southern mine. To remedy part of the difficulty the Electro-Bleaching Gas Co. has established a distributing warehouse at Joliet, Ill., for it can get carload shipments on a single priority order and avoid delay by sending a man with the car. Plants using these chemicals are urged to set forth their requirements to the proper authorities in their respective states. W. S. Cramer, Lexington, Ky., informed the members the situation had become so acute that the American Water-Works Association would soon have a representative in Washington to look after this and other problems confronting waterworks officials.

Municipal ownership of electric light and water plants was favored in a paper by F. T. Schultz, superintendent of the municipal plant at Columbus City. Mr. Schultz strongly advised the establishment everywhere of the meter system for water service, as, he said, the meter prevents waste and reduces the expense of operating the plants.

Abolishment of private wells in all municipalities was advised by W. C. Duncan, of Columbus, Ind., in an address at the closing session of the meeting, March 28. The association was greatly interested in a paper by Dwight S. Ritter, city purchasing agent of Indianapolis, who spoke on "Some Problems in City Purchasing."

A round-table discussion on "Public Service Investment in War Times" was conducted under the direction of J. B. Marvin, consulting engineer, of Frankfort, Ind. It was the consensus of opinion that the public utility companies should not seek to escape their responsibility for helping the war along on account of their loss in net earnings or through special taxes. Dr. J. N. Hurty, state health commissioner, discussed some of the lessons which may be learned from the physical examinations of soldiers.

Officers of the association were elected as follows: President, Dr. W. F. King, of Indianapolis; secretary-treasurer, W. G. Ulrich, of Indianapolis; assistant secretary-treasurer, J. A. Craven, of Indianapolis, and vice-presidents, J. W. Toyne, of South Bend; S. C. Geupel, of Evansville; Howard Dill, of Richmond, and E. C. Burch, of Washington.

MUNICIPAL INDEX

(Continued from page 309)

ministration. With particular reference to methods for securing publicity. By Jesse Lee Bennett. 3,000 words. New Jersey Municipalities. March. 25 cts.

MISCELLANEOUS.

City Planning.

Effect of Boulevard on Property Values. Philadelphia boulevard increases values over 20 sq. miles. 350 words. Municipal Journal. March 2. 10 cts.

Landscape Architecture. Its relation to civic development. By Arthur H. Helder. 2,500 words. New Jersey Municipalities. March. 25 cts.

Significance of New Laws Relative to Zoning and Set-back Lines. General discussion by author and members of the society. By Albert Lee Stephens. 3,000 words. Pacific Municipalities. March. 30 cts.

Report of City Planning Committee. American Water Works Assn. committee presents illustrations, with brief descriptions, of water works structures and grounds. 8 pages, 12 ills. Journal, American Water Works Assn. March. $1.00.

Construction.

Ditching with Dynamite in Wet Soil. Description of work done by Federal Govt. in the South. 700 words. Municipal Journal. March 30. 10 cts.

Lowering Ground Water Levels. Brief discussion of facilitating excavating trenches in wet ground. By Clarence L. Kirk and 5 others. 1,350 words. Journal, American Water Works Assn. March.

Contracts.

Cost-Plus-Fee Contracts with Divided Risk. Plan to be tried by Kansas City, Mo., in building viaduct. 500 words. Engineering News-Record. March 7. 20 cts.

Gambling Bids. Editorial comment on unbalanced bid for paving submitted in Boston. 1,000 words. Municipal Journal. March 30. 10 cts.

General.

Collapsible Form of Manhole Guard. Features of wooden manhole guard employed by Cleveland Electric Illuminating Co. By E. E. Noble. 4 ills., 700 words. Electrical Review. March 30. 30 cts.

Report on Rapid Transit System for Detroit. The full text of the report by Barclay Parsons & Klapp recommends partnership arrangement with D. U. R., flexible fare and combined subway and elevated structure. 6 ills., 2,700 words. Electric Railway Journal. March 2. 25 cts.

Convention of Alberta Assn. of Local Improvement Districts and Rural Municipalities. Account of convention held February 6 to 8. 10,000 words. Western Municipal News. March. 15 cts.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Bloomington, Ind., is to improve its WATER SYSTEM. The engineer for the work is C. H. Hurd.

Ford City, Ont., is to construct a SANITARY SEWER. The engineer for the improvement is O. McKay.

The city of Shreveport and Caddo county, La., are jointly to build a $100,000 BRIDGE. Plans for the structure have been completed by the consulting engineering firm of Waddell & Waddell.

A SEWAGE DISPOSAL SYSTEM is to be built by Paulsboro, N. J., at a cost of $100,000. The consulting engineering firm of Remington & Vosbury are at work on the project.

Cambridge, Mass., is to repair its RESERVOIR at a cost of about $90,000. Plans and specifications for the work were prepared by the consulting engineer, George A. Johnson.

Phillipsburg, N. J., is to construct SEWAGE TREATMENT WORKS. The consulting engineering firm of Fuller & McClintock had charge of the preparation of plans for the work.

WATERWORKS and SEWERAGE improvements are to be made by Ogden, Kans. Plans and specifications for the work were prepared by O. E. Noble.

SEWERS are to be constructed by Hamtramck, Mich., following the completion of plans, which are now in progress, by the engineer, George Jerome.

A FILTRATION PLANT to cost about $160,000 is to be built by Whiting, Ind. Plans are in course of preparation by the consulting engineering firm of Pearse & Greeley.

Richmond, Ind., through the Commercial Club, has been considering the problem of adequate SEWERAGE for the city. H. N. Logan, sanitary expert, has submitted a report on conditions and possibilities.

The U. S. Department of Labor is to spend about $60,000,000 on the HOUSING PROJECTS under its control. John W. Alvord, as consulting engineer; Frederick Law Olmsted as city planning expert, and Burt L. Fenner as architect have been retained to constitute an advisory board.

Municipal Journal

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A LOUISIANA ROAD FOR WAR-TIME TRAFFIC

Connecting Alexandria and Camp Beauregard—Five Per Cent Limiting Grade Necessitates Considerable Grading—Warrenite Laid on Broken Stone Base—Mixtures Used—Eliminating Grade Crossings—Difficult Pier Construction.

CONSTRUCTION WORK ON ROAD TO CAMP BEAUREGARD.

The parish, the state and two departments of the government—War and Agriculture—are cooperating in the construction of a road between Alexandria, La., and Camp Beauregard, the National Guard Cantonment near that city. Though constructed primarily for carrying the heavy war traffic between Alexandria and the camp, the road will also be a link in the main highway, construction of which is contemplated, between Camp Pike, near Little Rock, Ark., and Camp Beauregard. The section now under construction is to be about 4 miles long, and the paved portion 20 feet wide. The total cost will reach about $135,000.

In designing the road, long-radius curves and a grade limit of 5 per cent were adopted. Due to the rolling character of the country, this latter requirement made necessary considerable grading. This work, which involved the moving of about 60,000 cubic yards of earth, was done by force account. Wheel and drag scrapers were used almsot entirely, the average haul being under 300 feet, though in one or two places it was necessary to carry 500 feet. The maximum cut was 18 feet and the heaviest fill 25 feet. On the whole, cuts and fills balanced well and little earth had to be wasted. About 60 teams were employed on grading. The cost was approximately 40 cents per cubic yard. The general demoralization of labor, due to nearby military camp construction and consequent high prices, was a factor in this cost.

The base, surface, shoulders, ditches and culverts were all constructed by contract by A. R. Young & Company, Topeka, Kans. A base of crushed stone, compacted to a thickness of 6 inches, was specified, partly for reasons of economy and partly because of difficulty in getting other materials than a rather poor quality of stone and sand. The stone was shipped by rail from Winnfield, about 40 miles distant. It is a rather soft and friable limestone, unsuitable for use where exposed to the impact of traffic, but of good quality for a base and easily compacted into a firm foundation.

The stone is unloaded by hand from the cars into bins, whence it is discharged by gravity into 2-yard Troy dump wagons, which are hauled by four mules. It is spread on the subgrade in two layers, each about four inches thick. These are rolled separately and compacted into a mass having a total thickness of 6 inches.

On the base thus prepared is spread a layer of Warrenite which, when compacted, averages slightly over 2 inches in thickness (specifications call for an even 2 inches). This is rolled thoroughly, both longitudinally and transversely, with 10-ton rollers, of which there are two in use—Buffalo-Pitts and Case. On top of the sur-

SECTION OF COMPLETED ROAD.

face already rolled is placed a seal coat about ¼ inch in thickness. This also is rolled.

A Warren portable asphalt plant is used to mix the materials. This plant has a capacity of about 1,000 yards of surface per 10-hour day. The "hot stuff" is hauled from this plant, which is located about midway of the section being built, in 2-yard, 4-mule wagons and dumped directly onto the foundation, whence it is moved into place by rakes, shovels and hoes, especial care being taken to move every particle of material. Troy wagons are used, and these, with four mules, driven by a man riding one of them, average about 2½ miles an hour.

The mixture used for the wearing coat is approximately as follows:

	Pounds.
Clean washed gravel	1,880
Sand	400
Rock dust	350
Bituminous material	155

The gravel used varies from ¼ to 1¼ inches in size. It is local material and of good quality. The bituminous material is either Bermudez or Standard No. 9.

For the seal coat the mixture is about:

	Pounds.
Clean sand	2,375
Bituminous material	290

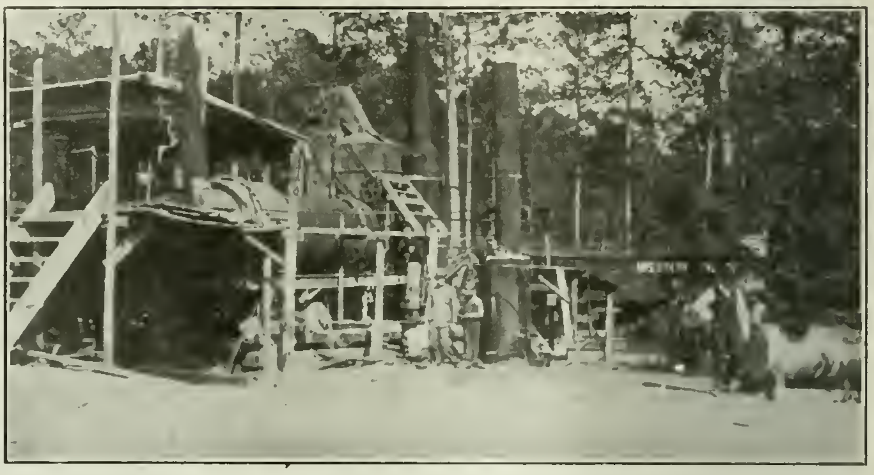
In addition to the heavy grading work, the cost of the road was further increased by the desire to eliminate all grade crossings. In one place, the road passes under the tracks of the Louisiana Railway & Navigation Company, while at another it is carried over the tracks of the Louisiana & Arkansas.

At the overhead crossing, the work was comparatively simple, a wooden bridge being built to carry the road traffic. Long fills were constructed at either end of the bridge to maintain the grade within the 5 per cent limits.

At the under pass, a two-span concrete viaduct was built to carry the railroad, which crosses the road at a skew. Owing to the limited headroom, it was necessary to place one of the piers in the center of the road, which was slightly widened at this point.

Considerable difficulty was encountered in securing suitable foundations for this concrete girder bridge. Just below the surface, quicksand was found, and though excavation was carried down ten or twelve feet no firm material was reached. Finally the difficulty was met by spreading the bases of the abutments and of the central pier, thus reducing the unit pressure to a minimum. It was necessary to carry the central pier somewhat lower than the others, though this depth did not exceed about ten feet.

Gutters had to be carried along both sides of the road under the viaduct and these had to be designed to carry considerable water. It was feared that, in excavating them, the support of the road foundation would be withdrawn, causing collapse. To protect the earth and sand underneath the road—and the abutments and pier as well—piling was driven parallel to and near the edge of the road, leaving a space about three feet wide between the piling and the abutment piers. The purpose of this piling is to act as a cofferdam, retaining the supporting material under the road, while allowing the excavation of a deep gutter between the road and the abutments. After the piling had been placed, the sand was excavated for a depth of about 30 inches along the gutter location and a concrete floor 8 inches thick was laid to prevent scouring by water. About 100 feet of piling was necessary to protect the road at this point. Tongue-and-groove pine 2½ inches thick was used. This was driven to a depth of 5 feet by a 1,600-pound drop hammer. About 18 to 20 blows were required to sink the piles to the proper depth.



PORTABLE PLANT USED FOR MIXING "HOT STUFF."

In constructing the bridge, the concrete was placed from a small tower just south of the road and along the railroad track. The concrete was mixed 1:1:3. A Chain-Belt mixer was used for all concrete work.

All culverts are of concrete, reinforced. The contract price for concrete work was $17.50 per cubic yard. The gravel shoulders, which extend three feet on each side of the road, cost $2.80 per cubic yard in place.

L. T. Gilmer is engineer in charge of the work; he also supervised the grading work, most of which was done last fall. Lester Valliant is superintendent for the contractors.

FOR A PERMANENT TRAFFIC POLICY.

The Chamber of Commerce of the United States met in Chicago last week and passed a number of resolutions bearing upon the conditions brought about by the war and the necessities originating with them. Among these it included the matter of transportation, urging the government to use to the utmost possible extent not only the railroads, but also inland and coast-wise waterways and highways, considering it to be essential that highways for heavy traffic be completed where they can be used in relieving railroad congestion. It recommended the adoption of a permanent policy assuring coordination of railroads, waterways and highways for traffic service.

Similar Resolutions were adopted April 16th by the Highway Traffic Association of New York State, which resolutions will be found on another page of this issue.

ROAD WORK DURING 1918

Amount That the Highway Authorities of the Several States Expect to Lay During the Present Year—How the Funds Will Be Raised—Effect of War Conditions on Road Program.

The amount of money that the state highway officials expect will be used in the several states for road work during the present year is reported to be nearly three hundred million dollars. Whether or not all of this, or how much of it, will actually be spent will depend largely upon the ability of the several states and counties to obtain the material and labor. Apparently no difficulty is anticipated by any of them in obtaining funds for all the work that can be constructed.

A few weeks ago a large business corporation interested in the paving business gathered data from all of the states, on which it based an estimate of the amount which would probably be spent by each of them this year. During the past month Municipal Journal has obtained similar information, which appears to indicate that a number of the states recently have increased their estimates of the amount of work that will be done, while a few of them are of the opinion that conditions may reduce the amount which it is practicable to do, even though the funds for much more will be available.

The largest amount reported by any state is $25,000,000, the estimate of Texas. Julian Montgomery, chief office engineer of the State Highway Department, informs us that this amount will be spent, "contingent on the war situation." Of this amount, $1,753,973 will come from the federal aid fund, $1,000,000 will be provided by the state, and the balance, or $22,246,027, will be provided by counties or other districts.

BINS THAT RECEIVE STONE FROM CARS AND LOAD WAGONS BY GRAVITY.

The next in order are Indiana, with a proposed expenditure of $17,[illegible]30,000; Illinois, with $17,000,000; Massachusetts, with $15.637,000; Iowa, $15,500,000, and Arkansas, $15,000,000. Concerning the Massachusetts estimate, William D. Sohier, chairman of the State Highway Commission, writes: "This year the total expenditure will be about $15.637,000, of which $7,624.889 will be for construction and reconstruction, and $8,012,333 will be spent for maintenance, oiling, etc. Of this amount, the state will provide $2,795,000." It is probable that $85,000 will be obtained from the federal aid fund, although approval may be secured of projects involving $300,000 to $400,000 of federal aid. The cities and towns will provide about $12,842,000, of which 40 per cent will go into improvements and 60 per cent into maintenance. The above also includes bridges, for which about $600,000 will be required.

Next in order come West Virginia, with $14,000,000; California, with $12,000,000; Minnesota, with $11,500,000; Pennsylvania, with $11,000,000; Kansas, with $10,500,000; Wisconsin, with $10,125,000. Concerning the Minnesota estimate, Charles M. Babcock, commissioner of highways of Minnesota, writes that, of the $11,500,000 that he expects will be spent this year in that state, $853,047 will be federal aid, $2,220,000 will be state aid, $4,627,676 will be county road and bridge funds, and the remainder will be township funds. Of this amount, practically all except the township funds are expended under the direction of the Highway Department.

Concerning Pennsylvania's estimate, George H. Biles, acting chief engineer of the State Highway Department, states that of the $11,000,000 that he expects will be spent in that state, $1,382,000 is from federal aid, $7,025,500 will be provided by the state, and $3,000,000 by counties or other districts.

In Kansas $10,500,000 is available, of which W. S. Gearhart, state highway engineer, writes that he thinks about $4,000,000 will be spent, of which $625,000 will be federal aid, $25,000 will be for state administration, and $3,275,000 will be provided by counties or other districts.

Concerning the expected expenditure of $15,000,000 by Arkansas, William B. Owen, chairman of the State Highway Commission, states that there are at the present time more than 22,000 miles of the various types of roads under construction, or with construction provided for, at a cost of more than $12,000,000. In addition there are numerous improvement districts in course of formation which he is sure will go through which will spend

OLD RAILROAD CROSSING BEING REPLACED WITH CONCRETE STRUCTURE.

OVERHEAD CROSSING TO REPLACE OLD GRADE CROSSING, SHOWN IN FOREGROUND.

more than $3,000,000. The estimate of more than $15,000,000 does not include improvements made by the counties, out of the 3-mill road tax, the expenditure of which is not under the supervision of the state department. As road districts are being continually formed, the above figures have to be supplemented almost daily. Probably the largest project in the whole country is one covering 168 miles of road to be constructed part of macadam, part of gravel, and 115 miles of asphalt concrete on a concrete basis at a cost of $2,788,000, the contract for which has already been let. Besides the federal aid of $650,000, an equal amount will be provided by the state from the auto license tax, while the balance will be derived from bonds raised by the improvement districts.

Tennessee is reported by the secretary of the State Highway Department to anticipate spending $10,000,000, of which $600,000 will come from federal aid, $1,200,000 will be provided by the state, and the balance by counties and other districts. This includes the cost of bridges to be built, as well as roads.

New York may spend about $8,500,000. I. J. Morris, secretary of the State Highway Commission, writes: "We have in force construction contracts, the amount of work remaining to be done under which aggregates about $7,000,000. Of this, approximately three-fourths is paid by the state and one-fourth by the counties. Present indications, based on the experience of last year, are that labor and material will be available to perform about $4,500,000 worth of this work. We do not anticipate that it will be possible to get it all done. In addition to this, we have nearly $4,000,000 available for maintenance and repair of improved roads by state funds. This we expect will probably be expended. None of the moneys to be expended this year come from federal aid."

James Allen, highway commissioner, says that $7,216,000 is the estimate of the State of Washington, but this does not include amounts that may be expended from bond issues, the amount of which cannot be estimated. Of the above sum, $216,000 is federal aid, $2,500,000 will be provided by the state, and $4,500,000 by counties and other districts.

Concerning Ohio H. L. Hastings, chief clerk of the State Highway Department, gives as the estimate of this year's expenditure $7,210,000, of which $1,120,000 is federal aid, $4,090,000 will be provided by the state, and $2,000,000 by the counties and other districts.

New Jersey is reported by A. Lee Grover, secretary of the State Highway Commission, as anticipating spending $8,000,000 this year. This is nearly double last year's expenditures, the large advance being due to the new State Highway system, which is financed under a 1-mill tax that yields $3,000,000. This total of $8,000,000 is in addition to a considerable amount that will probably be spent entirely from county funds; $118,425 of the total is federal aid, $5,500,000 will be provided by the state, and $2,500,000 will be provided by the counties.

Oklahoma expects to spend $6,000,000, of which $475,000 will be from federal aid, $1,475,000 provided by the state, and the balance by the counties or other districts.

Oregon expects to spend $5,652,516, of which G. E. Ross, secretary of the State Highway Commission, informs us that $855,506 will be from federal aid, and the balance will be provided by the state. Louisiana, $5,300,000; Kentucky, $4,500,000; Georgia, $4,300,000; Missouri, $4,000,000; Colorado, $3,635,000.

G. P. Coleman, state highway commissioner of Virginia, says that at the date of writing, March 22d, they had in view approximately $2,500,000, exclusive of maintenance, and $1,100,000 for the latter. Neither of these include ordinary county road construction, which does not come under this department. Of the $2,500,000 for construction, $600,000 will be from federal aid, $1,400,000 provided by the state, and $500,000 by the counties or other districts.

Mississippi expects to spend $3,500,000; North Dakota, $3,500,000. Concerning Maine, chief engineer Paul D. Sargent reports that on state highways, federal aid roads and state aid roads they expect to spend $1,517,000, of which $275,000 will be provided by federal aid, $924,000 given by the state, and $300,000 by the counties and towns. Besides this, they expect to spend $500,000 on maintenance of state and state aid roads, of which about $150,000 will come from the cities and towns, the remainder being supplied by the State Highway Commission from automobile license fees. The cities and towns will probably provide about $1,200,000 for ordinary maintenance and some construction work outside of the state aid roads. This gives a total of about $3,217,000.

Concerning Arizona, T. F. Nichols, the office engineer of the State Highway Department, reports that they expect to spend $3,000,000, of which $200,000 will be from federal aid, $900,000 provided by the state, and $1,900,000 by counties or other districts.

Montana expects to spend $3,000,000, of which about $150,000 will be from federal aid, and all of the balance will be furnished by the counties. The State Highway Department will furnish only the cost of engineering on federal aid projects. Florida, $2,750,000; Maryland, $2,700,000; Alabama, $2,500,000. Connecticut reports through C. G. Nichols, chief clerk of the Highway Commission, that the legislature made appropriations for the two years ending September 30, 1919, as follows:

For construction	$2,500,000
For maintenance and reconstruction	1,350,000
For elimination of dangerous conditions on trunk lines	75,000
For bridges, construction and maintenance	980,000
For maintenance of two toll-bridges and three ferries	50,000
For administration, including engineering expenses	253,000

The commission has one contract under federal aid for a total of $134,054, of which the United States Government will contribute about $53,000. On construction work, towns contribute one-fourth or one-eight on state aid roads, depending upon the amount of assessed valuations of the towns in which the work is done. On repairs and maintenance of state aid roads, the towns refund one-fourth. Counties have no part in road work in Connecticut.

North Carolina expects to spend $2,500,000, of which $684,000 is from federal aid. Michigan, writes State Highway Commissioner Frank F. Rogers, has available $872,000 of federal aid funds, for the three years of 1917, 1918 and 1919, which represents a total expenditure of about $2,000,000. All of this will not be spent this year, but a considerable part of the contracts will probably extend over into 1919. This federal aid work will cover about 180 miles of road. In addition to this, the state proposes to build about 170 miles of special assessment roads under the act of the 1915 legislature. Complete returns have not been received from counties and townships, but the State Highway Department is emphasizing the importance of concentrating work on through roads and using local materials, shipping in materials only for very important roads; this being done in order to relieve railroad transportation.

Gov. W. E. Lindsey of New Mexico writes that his state expects to spend $1,621,000 up to June 30, 1919, of which $303,000 is federal aid, $137,000 is county aid, $440,000 is state aid to offset these two items; $481,000 is by counties direct, in addition to $54,000 auto revenues to the counties; $133,000 is forest aid, $2,000 is state road fund, $17,000 is from state highway bonds, and $54,000 is state auto revenues.

South Carolina expects to spend $1,498,000; Nebraska, $1,279,757; Utah, $1,131,754; Delaware, $1,000,000; Wyoming, $806,000; Vermont, $685,000; Rhode Island, $600,000. New Hampshire will have $1,075,600 available for this year and next, of which $125,600 is from federal aid, $50,000 will be provided by the state, and $400,000 by counties or other districts.

Nevada expects to spend $506,000; South Dakota, $300,000, of which $100,000 will be federal aid, $50,000 will be provided by the state, and $150,000 by counties or other districts.

EFFECT OF WAR CONDITIONS.

The highway commissioners were asked: "Is your road program curtailed by any condition caused by the war and if so in what way?" The more important replies received to this question were as follows:

Commissioner Babcock of Minnesota says: "Our road program has not been curtailed by any condition caused by the war, except that it has been placed on a more efficient and substantial basis. Our activities this year and during the period of the war will be confined to only the substantial improvement of main lines of travel and to intensive maintenance of the general road system."

Col. Sohier, of Massachusetts: "The war has affected us a great deal. The state will cut down its construction expenditures for highways about $2,000,000. It will confine all its work to the main through routes, filling in the weaker places and trying to maintain the older roads. As far as possible we shall use local materials combined with bitumen. The war has about doubled our costs over those of a few years ago."

George H. Biles, of Pennsylvania: "Practically all the work under contract and proposed for construction by this department during the present year is contingent upon the orders issued by the Director General of Railroads covering the use of railroad cars for the shipment of road building materials."

W. S. Gearhart, of Kansas: "It is now evident that a considerable part of it (the amount available) can not not be finished on account of the labor shortage and the inability to get materials."

In Arkansas, Chairman Owen writes, the program is curtailed by labor shortage and difficulty in transporting

(*Continued on page 324.*)

COUNTY HIGHWAY WORK PEFORMED DURING 1917

Data Furnished Expressly for These Tables by County Highway Officials in All Sections of the Country—Amount, Nature and Cost of Each Kind of Road Construction in Each County.

EARTH ROADS BUILT IN 1917.

County & State.	Amount built miles or sq. yds.	Cost per mile or sq. yd.	Width of roadway graded.	Cost of grading per mile.
Arizona:				
Greenlee	140,000	$995	18	$600
California:				
San Louis Obispo	40†	150	16–20	...
Colorado:				
Morgan	50	32–50	30	...
Florida:				
Orange	45*†	200a	30	...
Georgia:				
McIntosh	29†	...	24–30	...
Idaho:				
Canyon	60†	175a	28	...
Cassia	10	300b	25	300
Lemhi	22	...	16–22	...
Power	24	500	24	200
Illinois:				
Carroll	5*	3,000b	24	2,000
Christian	7.7	2,960c	24	...
Clay	1.1	6,000b	24	...
Dupage	2*	4,000	30	...
Fulton	5*	2,200	24	...
Kane	33†	75–200	24	...
Lake	15	...	..	500
Marshall	4*	3,232d	..	...
McDonough	11*	2,600b	24	1,500
Schuyler	40†	...	28–34	200
Stephenson	30	50a	30	50
Washington	4*	2,000d	24	...
Iowa:				
Adams	23†	89a	36	89
Appanoose	30†	36a	36	36
Cedar	3.9*	...	24–26	2,660
Cerro Gordo	25*	1,400a	24	1,400
Cherokee	16.25*	0.255a	26	...
Clayton	9.5	750a	26	750
Des Moines	0.3	0.50	..	...
Dickinson	41*	0.25a	26	...
Fayette	15	...	..	...
Floyd	12,149†	0.356	26	96
Greene	12	...	24	772*
Hancock	6.08	8,338	..	
Harrison	26.5†	575a	26	575
Humboldt	8.5	...	36	1,300
Ida	3†	2,500a	18	2,500
Jasper	12,000	0.28	28	1,750
Jefferson	24†	93a	36	93
Johnson	8.5†	1,500	26–36	...
Kossuth	16.5*	...	26	1,110
Lee	41†	105	..	...
Lyon	2e	...	24–26	3,678
Mahaska	12	2,000a	32	2,000
Marshall	6.6*	22	26	...
Mills	24†	0.28	28	...
Mitchell	25.5†	...	26	108
Muscatine	11.4*	1,000–4,000a	24	...
O'Brien	19*	0.25	..	...
Iowa (Continued).				
Osceola	3.5*	0.27	24–26	...
Tama	6*	1,600a	26	1,600
Webster	7†f	1,300	..	...
Kansas:				
Logan	65†	35a	25	35
Kentucky:				
Greenup	30*	2,100	22	2,100
Nicholas	9.75*†	...	..	...
Trimble	15	30a	16	30
Michigan:				
Luce	6*	1,012	24	...
Minnesota:				
Anoka	5*	...	24	1,250
Brown	17*	...	24	840
Cottonwood	22*	1,342	24	1,200
Goodhue	10†	0.32a	24	...
Isanti	4†	1,500	36	...
Itasca	20*	2,500	20	...
Martin	16†	...	24	...
Nicollet	7.43*	678a	20–24	678
Redwood	11*	2,000–3,600	24	...
Roseau	20	...	24	...
Todd	15†	900	..	...
Missouri:				
Camden	100†	200	24	60
Miller	100†	170a	16–24	170
Polk	50	75	18	...
Douglas	50†	500a	24	500
Jasper	47	...	..	130
Lincoln	54.5	283	25	...
Mississippi	35*	500	40	400
Ste. Genevieve	100	...	..	...
Washington	30†	...	24	500
Montana:				
Carbon	73	350†	18–30	...
Gallatin	25*†	...	24	500
Granite	15†	...	24	400
Madison	55	...	18	420
Nebraska:				
Keyapaha	4*	30	40	...
New York:				
Schuyler	150	50a	26	50
North Dakota:				
Divide	38*	...	20	500
Ohio:				
Scioto	10	...	..	...
Oklahoma:				
Craig	20	...	..	...
Harper	34	...	..	778
Kingfisher	20†	...	30	50
Kiowa	70	...	..	400
Major	5	...	..	...
Okmulgee	36	...	24	400
South Dakota:				
Deuel	90†	1,000	36	37

EARTH ROADS BUILT IN 1917 (Continued).

County & State.	Amount built miles or sq. yds.	Cost per mile or sq. yd.	Width of roadway graded.	Cost of grading per mile.
Tennessee:				
Lawrence	15*	1,200	21	...
Monroe	40*	1,500	18	...
Unicoi	10.5	2,000	16–24	2,000
Texas:				
Taylor	25†	125	32	...
Vermont:				
Windham	5.75†	...	16–18	1,230
Washington:				
Adams	8*†	...	24	1,776
Columbia	40	...	..	...
Douglas	10*†	...	9–12	2,000
Grant	50†	...	..	200
Pend Oreille	17.5	865	16	...
Pierce	10	1,100	12–16	...
Snohomish	5†	2,500	20	...
Whitman	5	...	..	...
West Virginia:				
Barbour	20	3,700	..	...
Gilmer	5	...	..	...
Grant	60	90	16	...
Raleigh	20*	5,000a	18–22	5,000
Webster	40	5,000	18	5,000
Wisconsin:				
Douglas	37*	...	24	1,768
Grant	17	1,950a	20	1,950
Juneau	2†	0.14	20	300
Monroe	3†	...	20	987
Polk	15†	...	20	1,500
Sauk	7	900a	..	900
Shawano	11.5	...	24-28	1,500
Washburn	14†	1,400	26	...
Wyoming:				
Platte	15†	30a	24	30

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*By contract. †By day labor. a—grading only. b—includes culverts. c—includes grading, oiling and bridges. d—includes bridges and culverts. e—to permanent grade; also 53.5 miles at natural grade at a cost of $150 a mile. f—to permanent grade; also 61 miles of blade grading by contract at $175 a mile.

OILING ROADS IN 1917.

County and State.	Miles Oiled Last Year.	Amount of Oil Used. Gallons.	Cost per Mile
California.			
Alameda	3	0.75*	$1,000
Santa Clara	†	766	....
Illinois.			
Carroll	30	150,000	....
Christian	2	8,500	301
Dupage	9	26,000	600
Fulton	5	24,000	250
Iroquois	184	582,840	....
Lake	20-25	....	....
Marshall	4.5	10,000	217
McDonough	47	175,000	390
McHenry	50	40,000	100
Richland	2	8,000	263
Stephenson	20	20,000	150
Vermillion	10	1 car	....
Whiteside	8	....	200–400
Indiana.			
Wayne	12	36,000	150
Iowa.			
Cedar	40.8	150,000	174
Des Moines	2.75	9,887	366

OILING ROADS IN 1917 (Continued).

County and State.	Miles Oiled Last Year.	Amount of Oil Used. Gallons.	Cost per Mile
Iowa (Continued).			
Dickinson	1.9	8,105	458
Jasper	25	130,000	200
Jefferson	3.75	16,000	325
Lee	12.5	5 cars	305
Muscatine	5	12,787	140-240
Tama	0.75	0.5*	340
Maryland.			
Talbot	18	27,000	450
Montgomery	13	35,000	690
Michigan.			
Berrien	101	210,000	340
Van Buren	16	0.5*	28
Missouri.			
Callaway	0.6	3,365	560
Clay	10	3 cars	400
New Jersey.			
Burlington	100	150,000	....
Gloucester	19	65,000	421
Mercer	175	175,000	1,000
Morris	110	250,000	635
Passaic	76	139,084 151,517§	146 841§
Somerset	93.05	585,511	147
New York.			
Cayuga	35.44	53,000	336††
Cortland	6.45	14,603	595
Franklin	4.25	85,000	309
Onondaga	98	148,265	243‡
Schuyler	5.5	0.33*	225
Ulster	25.82	0.25*	523
Washington	2	6,000	300
Ohio.			
Franklin	44 114§	142,415 398,494	922 560
Highland	4	....	....
Huron	10	....	....
Sandusky	4	15,464	....
Shelby	9	20,000	800
Oklahoma.			
Craig	2	2.0*	....
Okmulgee	1	90 bbl.	240
Tennessee.			
Lawrence	20,000**	0.5*	0.975*
Texas.			
Taylor	4.5	0.5*	600
Vermont.			
Windham	18	....	204
Washington.			
Garfield	5	20,000	300
Pierce	6	15,000	600
West Virginia:			
Barbour	1	3*	10,000
Wisconsin.			
Adams	2.5	0.5*	175
Douglas	15	20,000	119
Grant	26	68,000	375
Juneau	22	40,000	140
Kewaunee	13	40,000	400
Monroe	44	118,352	238
Outagamie	19	50,000	325
Ozaukee	16	39,000	....
Rock	20	7,000	360
Sauk	40.5	95,644	335
Shawano	3	17,000	200
Walworth	20	45,000	350

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*Per square yard; †patching; §tarvia; ‡includes stone chips used as "blotter"; **square yards; ††not including chips for "blotter."

BRICK PAVEMENT LAID IN 1917.

County and State.	Amount built; miles or sq. yds.	Depth of cushion, inches.	Kind of filler.	Cost per mile or sq. yd.	Width of pavement, feet.	Width of roadway graded.	Cost of grading per mile.	Kind of base.	Thickness of base, inches.
California									
Santa Clara	3,537*	monolith	grout	$2.25	18	24	$1,989	....	4
Illinois									
Iroquois	4.25	....	grout	8,580^{a}	9	27	....	concrete	1
Peoria	6,111*	monolith	grout	2.04^{g}	18	28	1,577	concrete	4
Stephenson	5,333*	....	....	20,185^{b}	16^{c}	30	1,500	1:3½:6 conc.	4
Vermillion	17*	....	....	12,500^{x}	10	50	800	concrete	4
Whiteside	1*	¾	grout	16,500^{e}	16	32	....	macadam	4-5
Indiana									
Marion	2.5*	monolith	....	1.87^{c}	30 & 39	50	0.35^{f}	concrete	5
Iowa									
O'Brien	10,000*	1½	asphalt	2.31^{g}	56	..	....	concrete	4
Polk	2.5*†	monolith	grout	2.63^{h}	20	36	5,000	concrete	4
Michigan									
Berrien	6,500	....	....	2.38	44	44	....	gravel	8
Calhoun	10,000*	monolith	grout	22,500	18	28	....	concrete	4
New Jersey									
Morris	3,134* 4,562* 3,639*	....	....	1.70^{1} 1.50^{1} 2.80^{1}	34	34	....	1:3:6 conc.	6
New York									
Chautauqua	2.2*	1½	grout	20,000	16	32	3,000	concrete	5
Orleans	21,000*	....	....	1.35^{k}	..	..	....	concrete	5
Ulster	16,000*	1	sand	....	16-53	24-58	....	concrete	5
Washington	1.0*	....	....	....	30	..	....	concrete	6
Ohio									
Coshocton	7,260*	1	tar	2.00‡	16	26	1,000	gravel	9
	0.5*	monolith	....	2.45‡	16	26	1,500	gravel	9
Huron	31,263*	monolith	grout	1.91‡	16	30	1,700	....	4 & 5½
Madison	4,545*	2	grout	1.93‡	36	44	2,300	concrete	5
Sandusky	4.5*	1½	mastic	30,000‡	16, 18 & 22	26-28	1,500	concrete	4

BRICK PAVEMENTS LAID IN 1917 (Continued).

County and State.	Amount built; miles or sq. yds.	Depth of cushion, inches.	Kind of filler.	Cost per mile or sq. yd.	Width of pavement, feet.	Width of roadway graded.	Cost of grading per mile.	Kind of base.	Thickness of base, inches.
Ohio (continued)									
Scioto	0.75	1	grout	2.25	16	26	....	concrete	4
Summit	8.9*	monolith	grout	22,100[x]	16	30	....	concrete	4
W. Virginia									
Monongolia	2.5*	1	grout	27,200[x]	16	24	3,100	1:2½:5 conc.	5
Wisconsin									
Walworth	3,100*	....	....	2.30[l]	12	..	....	concrete	5

* By contract; † by day labor; ‡ does not include grading or any other work; [a] includes grading and culverts; [b] includes also 5,333 sq. yds. of concrete shoulders and all necessary culverts; [c] 8-ft. brick and two 4-ft. shoulders; [x] includes road complete; [e] includes culverts; [f] per cubic yard; [g] includes grading for thickness of pavement; [h] includes preparation of subgrade; [i] surface only, base cost $0.90, $1.00 and $1.30 respectively; [k] surface only, base cost $4.75 a cubic yard; [l] includes grading.

BITUMINOUS CONCRETE PAVEMENT LAID IN 1917.

County and State.	Amount built; miles or sq. yds.	Thickness, inches.	Cost per mile or sq. yd.	Width of pavement, feet.	Width of roadway graded, feet.	Cost of grading per mile.	Kind of base.	Thickness of base.
California								
Alameda	57,231*	2	$1.17	24	29	$0.135[a]	1:2:4 concrete	5
Ventura	7.6†	¾	.27[b]	16	..	....	concrete	1
Indiana								
Marion	3*	2	1.65[c]	24	50	0.40[d]	concrete	5
Maryland								
Talbot	12*	..	12,000[c]	14	24	5,000	......	..
Michigan								
Calhoun	3*	2	1.18[b]	18	28	....[f]	concrete	6-8
New Jersey								
Burlington	3*	2½	1.35	18	30	0.60[g]	macadam	6
Mercer	32,000	2	.95	18	30	300	macadam	6
Morris	191,868*	..	1.00-1.50[b]	18 & 34	..	....	1:3:6 concrete	6
Passaic	97,400*	..	1.35[b]	26	34	4,475	broken stone	5
Salem	2.126*	2½	12,314[b]	20	30	2,470	macadam	5½
Ohio								
Wood	70,000*	2	1.01[e]	18	28	700	concrete	5
Washington								
Pierce	1	..	16,000[e]	17	23	1,000	concrete	5

* by contract; † by day labor; [a] per square yard; [b] includes surface only; [c] includes grading, culverts and small bridges; [d] per cubic yard; [e] includes grading and culverts; [f] total cost of road, $72,000; [g] per yard.

CONCRETE PAVEMENT LAID IN 1917.

County and State.	Amount built; miles or sq. yds.	No. of courses.	Thickness, inches.	Cost per mile or sq. yd.	Width of pavement.	Width of roadway graded.	Cost of grading per mile.	Mixture used.	Is reinforcement used?	Intervals between expansion joints
California										
San Luis Obispo	10*	1	4	$16,000	15	21	....	1:2:4	no	none
Santa Clara	92,903*	1	4	1.20[a]	18	24	$1,980	1:3:6	no	none
Stanislaus	86*	1	4 & 5	10,000[b]	12 & 16	....	....	1:2:4	yes	33⅓
Ventura	48.5*	1	4	0.75[c]	16 & 18	28	....	1:2½:5	sometimes	none
Illinois										
Fulton	1.5*	1	7½	1.25[c]	15 & 20	30	....	1:2:3½	no	50
Kane	12,600*	1	6-7	24,065[d]	18	30	....	1:2:3½	......	none
	12,296†	1	6-8	16,198[d]	15	24	....	1:2:3½	......	......
Lake	1.5*	1	7	1.72[c]	18	30	....	1:2:3½	no	day's run
Peoria	47,179*	1	6 & 7½	1.42[c]	15	25	1,774	1:2:3½	no	none
Schuyler	1.5*	1	6 & 7	1.135[c]	10	33	1,100	1:2:3	no	none
Vermilion	40*	..	....	8,500[d]	10	50	800	1:2:3	no	100 to 200
Indiana										
Johnson	0.21*	1	8	14,784[b]	16	20	....	1:2:3	no	20
Marion	22*	..	...	1.45-1.85[e]	18-30	50	....	1:2:3	yes	......
St. Joseph	4.9*	1	6-8½	....	10 & 14	20	....	1:1½:2½	no	30
Shelby	600*	..	..	....	12	20	....	1:2:3	......	25
Wayne	102,000*	1	6-8	1.30[f]	18	28	....	1:2:3	yes	36
Iowa										
Cerro Gordo	1.5*	1	6¾	2.23[c]	16	24	1,500	1:2:3½	......	.....
O'Brien	10,000*	1	6	1.71[g]	30	..	....	1:2:4	no	30-35
Maryland										
Talbot	14*	..	...	11,000[f]	14	24	4,500	1:2½:5	no	150
Michigan										
Macomb	2.23*	1	8	37,100[e]	20	28	....	1:2:3	where necessary	30-35
New Jersey										
Burlington	1.25*	..	...	2.29	18	30	....	1:2:3	yes	25
Gloucester	8,700	..	...	1.91[b]	16	30	2,618	1:2:3	yes	33⅓
Mercer	10,000*	1	...	0.88	18	30	7,000	1:2:3	no	30
Passaic	11,136*	..	6½, 8 & 8½	2.43[c]	23	27	2,852	1:2:3	......	35
New York										
Chautauqua	5.5*	..	5-7	16,000	16	32	3,000	1:1½:3	yes	30
Onondaga	1.13*	1	7	1.50[b]	16 & 18	24	1,500	1:2:3½	no	50-100
Schuyler	4.5*	1	5	5.50	14	26	2,500	1:2½:5	yes	30
Ulster	11,200*	1	6	6.00[c]	14-24	24	....	1:1½:3	no	30
Ohio										
Huron	104,374*	1	6	1.29-1.70[c]	10 & 16	28	1,700	1:1½:3	on 16-ft. roads	50 & 100
Shelby	8,676*	..	..	2.25	16	26	2,800	1:1⅓:3	yes	50
Oklahoma										
Okmulgee	0.5	..	..	1.78	24	28	720	1:2:3	no	35
Washington										
Pierce	4.77*	1	..	18,500[f]	17	23	2,400	1:2:3	over soft spots	30
Snohomish	49.5*	1	5-7	13,000	16	22 & 24	2,500	1:5	over soft spots	30[1]
Whatcom	76,000	1	5½-7	1.45-1.57[c]	16	24	2,000	1:2:3	where needed	30
W. Virginia										
Mineral	4,467*	1	5¼-7	1.35[c]	15	20	12,000	1:2:4	no	50
Monongalia	1.0*	1	6-7½	23,000	16	26	3,000	1:1½:3	yes	none
Wisconsin										
Juneau	1.0†	..	..	5.74[c]	15	20	828	1:2:3	......	35
Monroe	6.68*	1	6-7	1.423[c]	9	20	987	1:2:3½	on swampy land	35
Outagamie	19.75*	1	6-8	10,000[d] 17,000[d] 18,000[d]	9 16 18	19 24 24	1,200	1:2:3½	no	35
Sauk	1.0*	1	6-8	1.30-1.40	15	22	....	......	no	35
Shawano	1,400*	2	6-8	1.75[b]	18	28	....	1:2½:3	over soft spots	35
Walworth	3,200*	..	..	1.52[b]	9	..	....	......	yes	40

* by contract; † by day labor; [a] includes grading and 1½ inch Topeka top; [b] includes grading; [c] includes concrete only; [d] total cost of road; [e] includes grading and small bridges and culverts; [f] includes grading, draining, culverts, etc.; [g] includes grading the thickness of the pavement; [b] includes grading and culverts less than 5 ft. span; [1] 25 ft. over soft subgrade.

WATER-BOUND MACADAM LAID IN 1917.

County and State	Amount built, miles or sq. yds.	Cost per mile or sq. yd.	Width of pavement	Width of roadway graded	Cost of grading per mile	Thickness
Illinois:						
Carroll	0.5*	$1,400	10	20	$200†	..
Dupage	7*	4,380§	9	..	....	..
Iroquois	2*	6,000[a]	10	26	....	9
Richland	1.25*	6,042§	10	22	614*	10
Indiana:						
Putnam	4*	11,000[b]	16	24	0.25[c]	8
	8*	....	9	20	0.20[c]	10 & 12
Tippecanoe	2*	4,800[d]	12	24	100	10
Wells	2*	5,982[a]	24	24	....	..
Iowa:						
Cedar	0.25†	1.18§	18	..	....	..
Lee	13†	535[e]	..	..	....	..
Tama	0.75†	2,000[f]	18	28	1,600	..
Kentucky:						
Christian	48*	5,000	14	20	....	..
Harlan	6*	8,000[f]	9	20	5,000	6
Henderson	3.5*	7,000[d]	14	22	....	..
Nicholas	2.75* 7.00†	3,200[g]	14	22	215	..
Trimble	4.5	3,000[d]	9	16	130	..
Maryland:						
Talbot	18*	9,500[a]	14	24	4,500	..
Michigan:						
Alger	3†	8,000[f]	14-16	24	3,000	7
Berrien	10.75	8,900	16	24	120	6-8
		7,100	12	24	120	6
Luce	6*	5,614	14	24	1,281	..
Van Buren	2†	10,000	16	24	600	..
Minnesota:						
Anoka	700*	0.60§	33	33	....	..
Missouri:						
Jasper	8	1,100	..	14	130	..
Sta. Genevieve	10	1,800	12	18	....	..
New Jersey:						
Mercer	40,000*	0.60	16	30	2,500	6
Salem	2,860*	11,207§	18	30	3,763	5½
Somerset	1.9	....	14	33	....	2½
New Mexico:						
Luna	11,000†	4,750	18	30	750	..
New York:						
Cayuga	15.68†	4,163§	12	24	1,088	8 & 10
Chautauqua	5†	4,500	9	30	800	..
Cortland	8†	3,933[a]	12	24	1,181[a]	6
Franklin	4.1†	2,126[f]	10	24	....	10
Onondaga	3.5†	not completed	12	24	1,600	12
Ohio:						
Carroll	15,867*	0.66§	14	26	4,147*	8
Franklin	23.28	8,957[a]	16	28	....	10
Gallia	2†	11,000	14	24	1,500	6
Highland	34,000*	0.75[b]	14	26	900	4
Muskingum	1*	0.90§	..	..	....	..
Sandusky	56,700*	0.90§	10-16	20-26	1,350	..
Shelby	35,167*	0.41[f]	16	26	1,100	8
Summit	2.8*	6,663[d]	14	30	....	7
Wood	228,000*	0.90[b]	16	26	680	7½
Tennessee:						
Cocke	30*	2,000	10	20	3,000	8
Franklin	45*	3.300	8	20	1,000	..
Greene	32*	0.38§	9	16-20	1,200	6
Monroe	50*	2,500§	9	..	....	..
Unicoi	36,080*	0.555	9 & 14	24	1,350	..
Union	7*	2,800	..	20	1,500	..
Washington:						
Douglas	2.14*	2,800	16	20	2,700	6
Garfield	14,924*	4,500[a]	16	24	2,500	7½
Kittitas	9.91*	3,974[i]	12	20	....	9
Walla Walla	36,160*	0.568[f]	12	20	....	8
Whitman	12	7,000	16	24	2,200	..
W. Virginia:						
Mineral	26,700† 18,100*	0.86§ 0.86§	14	20	1,000	8
Wisconsin:						
Adams	2,605†	0.83	16	24	....	..

GRAVEL ROADS BUILT IN 1917.

County and State	Amount built, miles or sq. yds.	Cost per mile or sq. yd.	Width of pavement	Width of roadway graded	Cost of grading per mile	Thickness
Alabama:						
Talladega	5†	$2,000§	..	30	....	9
Arizona:						
Greenlee	10,500	....	18	18	....	..
California:						
San Benito	8	0.15	14	..	....	..
San Louis Obispo	20†	800[a]	13	..	....	..
Colorado:						
Morgan	45	500[b]	..	30	$32-$50	..
Idaho:						
Canyon	45†	785[c]	16 & 18	28	175	..
Cassia	35*†	2,100[d]	18	22	600	..
Power	9	1,800	16	24	....	8
Illinois:						
Gallatin	3	....	..	18	....	14
Kane	120,000†	....	8	..	....	..
Lake	15†	2,500	9-12	26	1,000	..
McHenry	7.5*†	6,000[d]	15	27	1,000	..
Whiteside	12	900-6,000[d]	9-15	22-30	150-1,000	..
Indiana:						
Johnson	14.91*	4,734[c]	..	..	300	..
Putnam	5	3,000-7,000	9	20	0.20[e]	12
St. Joseph	7.4*	5,962	14	20	....	..
Shelby	14*	3,000[d]	14	20	....	..
Tippecanoe	20*	3,150[b]	9	24	....	12
Tipton	1*	....	..	..	....	..
Wayne	2*	5,000[f]	..	..	....	..
Iowa:						
Black Hawk	5.08*	3,800[g]	12	26	741	10[h]
Clayton	1†	1,100[e]	26	26	....	..
Des Moines	0.5	116[i]	20	26	1,121	..
Dickinson	38.9*	1,295[c]	..	..	....	..
Floyd	5,934	0.816	14	..	....	5
Greene	17*	631§	8	..	....	..
Hancock	11.25	746[b]	..	..	....	..
Humboldt	16*	928§	10	..	....	..
Kossuth	17.8*	1,310§	10	..	....	..
Lee	0.34*	0.30[k]	..	32	....	..
Marshall	5*	1,050§	..	1,380	....	..
Mitchell	2.5†	0.48[i]§	12	26	335	5
Muscatine	0.09	0.07§	24	24	....	6
Osceola	1†	1,187	12	26	1,142	..
Polk	5	1,000[c]	10	26	800	..
Kentucky:						
Trimble	2.5	2,380[b]	9	16	....	..
Michigan:						
Calhoun	40*†	....	9	24	....	..
Luce	3†	6,600	14	24	911	..
Mackinac	2*	2,750§	14	24	3,000	8
Macomb	39.53*	6,280[d]	9-16	22-24	....	..
Otsego	2.5†	....	..	9	613	16
Ottawa	10	4,000[c]	9	24	400	10
Van Buren	5†	6,600[c]	9-16	24	500	..
Minnesota:						
Anoka	8*	12,000	12-18	24	2,000	8
Brown	10*	800	..	..	....	..
Crow Wing	4†	3,500[d]	..	24	....	..
Goodhue	4.5†	1.10§	15	24	....	..
Isanti	6†	4,000[d]	..	36	....	..
Itasca	5*	2,000	16	20	....	..
Nicollet	8.87*	616.35[c]	10	20-24	702	..
Redwood	31.8*	700-1,500§	16	24	....	..
Roseau	2	....	8	24	....	..
Todd	3.5†	2,000	..	..	....	..
Mississippi:						
Alcorn	15*	3,000[c]	12	24	....	..
Missouri:						
Jasper	37	635[c]	..	9	130	..
Lincoln	18†	1,200§	10	22	45	..
Miller	15	200§	10-24	16-24	100-200	..
Ste. Genevieve	40	1,600[c]	12	17	....	..
Washington	15†	2,500	16	24	600	..

Door	16	3,200[a]	9	23	800	..
Douglas	1.5†	0.52§	9	24	....	..
Grant	20,000†	0.60[b]	9	20	....	8
Juneau	5†	0.75§	9	20	1,000	..
Kewaunee	2.1†	3,500[i]	..	24	....	..
Monroe	26,125†	0.805§	9	20	987	..
Ozaukee	3.5†	5,000[b]	9-15	24	1,020	..
Polk	1.5†	3,200[a]	9	20	1,400	..
Rock	2*	3,500[f]	9	20	950	..
Sauk	12†	4,500[f]	9	20	....	8
Shawano	0.75†	0.63§	9 & 15	28	1,300	4
Walworth	32,700*†	0.75	9 & 15	..	....	..

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* By contract; † by day labor; § does not include grading or other work; [a] includes grading and culverts; [b] includes grading, culverts and bridges; [c] per cubic yard; [d] includes everything; [e] resurfacing; [f] includes grading; [g] reconstruction, no grading except surfacing and ditching; [h] includes grading and ditches; [i] includes shoulders and light grading.

BITUMINOUS MACADAM PAVEMENT LAID IN 1917.

County and State	Gals. of bitum. material used per sq. yd.	Amount built, miles or sq. yds.	Cost per mile or sq. yd.	Width of pavement	Width of roadway graded	Cost of grading per mile	Thickness
California:							
Monterey	..	6	$6,000[a]	15	..	....	..
Santa Clara	1¼	20,287*	0.52[a]	14	20	$450	6
Ventura	1	0.5†	0.72§	16	..	....	6
Illinois:							
Iroquois	2	9	8,500[c]	10	28 & 30	....	8
Maryland:							
Montgomery	½	3†	7,000[b]	10	20	900	8
Minnesota:							
Itasca	2½	......	....	18	26	1,500	4
New Jersey:							
Morris	2	25,141*	0.80§	..	..	4,000	..
New York:							
Franklin	2¼	4.25†	1,861[a]	12	28	....	4
Onondaga	2¼	5.0†	not completed	12	24	1,600	3
Ulster	..	2.5*	0.95§	14	24	....	..
Ohio:							
Franklin	2½	2.52	7,107	16 & 18	..	....	4
Muskingum	{ 2	12,800*	1.13§	16	26	1,800	6-8
	{ ..	11,590*	1.27§	14	26	2,370	6-8
Scioto	2¼	1.35	....	20	32	....	6
Shelby	..	34,270*	0.64§	16	26	2,000	8
Wood	2	46,000*	1.00[d]	16	26	700	2½-6
Vermont:							
Windham	1¾	4,200†	....	..	..	....	6
Washington:							
Walla Walla	1¼	22,192*	0.486§	16	24	....	8
West Virginia:							
Barbour	3	1†	2.25[e]	14	22	3,500	..
Raleigh	2¼	3.5*	1.34-1.41	9[f]	18-22[g]	4,000	..

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* By contract; † by day labor; § does not include grading or any other work; [a] includes grading; [b] includes grading, bridges and drainage; [c] includes grading and culverts; [d] includes grading and ditches; [e] includes fine grading; [f] also 3-ft. stone shoulder on each side; [g] 18 ft. in fills, 20-in. cut and fill, 22-in. cut.

BITULITHIC LAID IN 1917.

County and State	Amount built, miles or sy. yds.	Thickness, inches	Cost per mile or sq. yd.	Width of pavement, feet	Width of roadway graded, feet	Cost of grading per mile	Kind of base	Thickness of base, in.
California:								
Alameda	35,120*	2	$1.60[a]	18	20	....	1:3:6 concrete	6
Ventura	18*	1	0.36[b]	16, 18 & 20	..	....	concrete	4
Michigan:								
Ottawa	4	..	12,000	16	24	$400	....	8
Washington:								
Pierce	5	..	16,000[c]	17	23	1,000	concrete	5

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* By contract; [a] includes grading; [b] includes surface only; [c] includes grading, culverts, etc.

Montana:						
Carbon	4†	3,000	18	24	963	..
Madison	0.37	1,408[d]	16	18	312	..
Yellowstone	15*	0.43§	12	28	....	..
New Jersey:						
Salem	2.27*	2,932§	20	30	2,630	8
New Mexico:						
Luna	7†	3,300	18	30	0.24[k]	..
New York:						
Cayuga	9.42†	690§	7	24	....	..
Franklin	7.5†	1,547[c]	12	..	....	6
Schuyler	1	500	12	26	....	..
Ohio:						
Highland	50,000†	0.40[d]	12	24	800	6
Shelby	6*	4,100§	12	24	600	12
Oklahoma:						
Kiowa	1†	1,400§	20	24	....	..
South Dakota:						
Deuel	40†	100	..	..	....	..
Tennessee:						
Franklin	7.5*	2,000[d]	8	20	1,000	..
Lawrence	20*	4,000[c]	14	21	1,200	..
Texas:						
Taylor	5†	1,500	16	32	100	..
Vermont:						
Windham	14†	2,250[c]	..	18-21	....	..
Washington:						
Adams	5.5*	4,000[d]	16	24	2,000	9
Columbia	5.25*	6,700	16	24	3,600	..
Douglas	5.2*†	2,800[c]	16	24	2,700	6
Garfield	29,332*	4,000[f]	12	24	2,400	6½
Grant	25*†	1,800§	16	24	1,200	6
Kittitas	4.1†	1,883[c]	12	20	....	9
Okanogan	2.4*	901§	12	20	1,480	6
Pend Oreille	5	2,200[c]	16	20	....	..
Pierce	5	2,100[d]	..	12-16	1,300	..
Snohomish	10*	3,000-6,000[c]	..	24	....	..
Walla Walla	41,140*	0.449[a]	16	24	....	8
Whitman	6	6,800	16	24	2,500	..
Wisconsin:						
Adams	3,000†	0.13	9	20	1,200	..
Douglas	11.25*	0.40§	9	24	....	..
Grant	12,000†	0.51[c]	9	20	....	8
Kewaunee	4†	3,000[b]	..	24	....	..
Polk	6†	3,100	9	20	1,400	..
Rock	32*	2,640[c]	9	20	950	..
Shawano	6.5†	0.35§	9-16	28	1,300	4
Walworth	42,500*†	0.37	9 & 15	..	....	..
Washburn	2†	2,200[b]	..	14	....	..

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* By contract; † by day labor; § does not include grading or other work; [a] no grading done; [b] road complete; [c] includes grading; [d] includes grading and culverts; [e] per cubic yard; [f] includes grading, ditching, bermes tile and culverts; [g] includes drains; [h] 10" for 9 ft., 5" for 3 ft. additional; [i] light surfacing only; [k] per cubic yard, includes grading and oiling; [l] per cubic yard.

SAND-CLAY ROADS BUILT IN 1917.

County and State.	Amount built, miles or sq. yds.	Cost per mile or sq. yd.	Width of pavement.	Width of of roadway graded.	Cost of grading per mile.	Thickness.
Florida:						
Orange	25*†	$1,200[a]	9	30	$....	..
Georgia:						
McIntosh	5†	....	24	30	....	..
Iowa:						
Johnson	5†	1,000	..	..	....	..
Muscatine	1.07*	0.05 to 0.18[b]	18-20	24	....	..
Michigan:						
Luce	1†	1,500	14	24	....	..
Minnesota:						
Anoka	7*	7,000[b]	14	20	1,500	..
Crow Wing	5†	3,000[c]	..	24	....	..
Itasca	4†	1,500[d]	16	20	....	..
Todd	1.5†	1,800	..	..	....	..

SAND-CLAY ROADS BUILT IN 1917 (Continued).

County and State.	Amount built; miles or sq. yds.	Cost per mile or sq. yd.	Width of pavement.	Width of of roadway graded.	Cost of grading per mile.	Thickness.
New York:						
Schuyler	3	200	16	26	....	..
North Carolina:						
Yadkin	28*	1,300[a]	16	26	900	10-12
Oklahoma:						
Kiowa	3†	500[b]	24	24	....	..
Major	6	0.30-0.50[c]	..	..	....	..
Okmulgee	8	1,600	16	24	530	..
South Dakota:						
Deuel	40	....	..	..	....	..
Texas:						
Taylor	5†	250	16	16	100	..
Washington:						
Grant	10†	700[b]	12	18	800	3
Wisconsin:						
Douglas	8.5*	0.10[b]	9	24	....	..
Juneau	3.7	0.25[b]	9	20	400	..
Monroe	17,033†	0.201[b]	9	20	987	..
Washburn	10†	1,805	..	26	....	..

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*By contract; †by day labor. [a]—includes grading; [b]—includes no grading or other work; [c]—includes grading and drainage; —includes regrading old roadbed; [e]—per cu. yd.

AVAILABILITY OF ROAD MATERIALS.

County & State.	Are there within the limits of the county adequate supplies of an acceptable quality of			Are Roads suitable for hauling these by motor truck?	Kind of road markers or signs used.
	Sand?	Gravel?	Crushed Stone?		
Alabama:					
Talladega	...	Yes	...	generally	None
Arizona:					
Greenlee	Yes	Yes	...	Yes	Sheet iron
California:					
Alameda	Yes	Yes	Yes	Yes	Wooden
Monterey	Yes	Yes	Yes	Yes	California Auto. Assn.
San Benito	Yes	Yes	Yes	Yes	Home painted.
San Luis Obispo	Yes	Yes	part	generally	......
Santa Clara	Yes	Yes	Yes	Yes	......
Stanislaus	not enough	not enough	not enough	Yes	California Auto. Assn.
Ventura	Yes	Yes	No	Yes	Auto. Club
Colorado:					
Morgan	Yes	Yes	No	Yes	Metal
Florida:					
Orange	Yes	Yes	No	Yes	State Auto. Assn.
Georgia:					
Laurens	...	...	...	...	None
Liberty	Yes	limited	none	fairly	Signs on posts
McIntosh	Yes	Yes	No	Yes	Wooden posts
Idaho:					
Canyon	Yes	Yes	No	a few places	None
Cassia	Yes	Yes	Yes	some	Board
Lemhi	Yes	Yes	Yes	No	None
Power	...	...	...	...	Steel
Illinois:					
Carroll	Yes	Yes	No	No	None
Christian	...	...	...	Yes	Steel angle 4 x 4 x 5 16
Clay	No	No	No	...	......
Dupage	No	No	Yes	Yes	Wood
Fulton	No	No	No	Yes	Metal and wood
Gallatin	Yes	Yes	No	No	None
Iroquois	No	No	No	not generally	Few of any kind
Kane	Yes	Yes	Yes	Yes	Concrete
Lake	partial	some	No	a few	None
Marshall	Yes	Yes	No	part of season	Wood
McDonough	No	No	No	at times	None
McHenry	Yes	Yes	No	when dry	Goodrich guide posts
Peoria	Yes	Yes	...	Yes	None
Richland	No	No	No	No	None
Schuyler	No	No	No	Yes	Steel and wood
Stephenson	No	No	No	No	Enamel on iron posts
Vermilion	No	No	No	No	None
Whiteside	some	some	poor	somewhat	......
Indiana:					
Johnson	Yes	Yes	No	Yes	Metal on concrete posts
Marion	Yes	Yes	No	Yes	Steel on concrete posts
Putnam	in some parts	...	Yes	fair	......
St. Joseph	Yes	Yes	No	most	......
Shelby	Yes	Yes	Yes	Yes	None
Tippecanoe	Yes	Yes	Yes	Yes	Sheet iron
Wayne	Yes	Yes	No	Yes	Galvanized corrugated metal
Wells	No	No	Yes	Yes	None
Iowa:					
Adair	No	No	Not developed	Yes	......
Adams	No	No	No	Yes	Wood
Appanoose	No	No	No	Yes	None
Black Hawk	Yes	Yes	soft lime stone	Yes	None
Cass	No	No	No	Yes	None
Cedar	Yes	No	No	when dry	None
Cerro Gordo	Yes	Yes	Yes	light	......
Cherokee	Yes	Yes	No	for 1 or 2-ton trucks	Steel set in concrete
Clayton	Yes	Yes	Yes	Yes	Steel
Des Moines	Yes	Yes	No	part of time	Metal (Galion Iron Works)
Dickinson	Yes	Yes	No	Yes	Pressed steel
Fayette	Yes	Yes	Yes	Yes	None
Floyd	Yes	Yes	Yes	Yes	None
Greene	Yes	Yes	No	Yes	......
Hancock	some parts	some parts	No	Yes	......
Harrison	No	No	No	Yes	None
Ida	not enough	No	No	Yes	......
Jasper	No	No	No	Yes	Wood
Jefferson	No	No	No	...	"Lyle" signs
Johnson	Yes	No	No	when dry	Lead on oiled cypress
Kossuth	No	Yes	No	fair	None
Lee	Yes	...	Yes	part of time	......
Lyon	Yes	Yes	No	when dry	Wood

AVAILABILITY OF ROAD MATERIALS (Continued)

County & State.	Are there within the limits of the county adequate supplies of an acceptable quality of			Are Roads suitable for hauling these by motor truck?	Kind of road markers or signs used.
	Sand?	Gravel?	Crushed Stone?		
Iowa (Continued):					
Mahaska	Yes	Yes	No	Yes	None
Marshall	Yes	Yes	No	summer only	......
Mills	No	No	No	Yes	Wood
Mitchell	Yes	Yes	Yes	...	None
Muscatine	Yes	Yes	Yes	Yes	None
O'Brien	Yes	Yes	No	Yes	None
Osceola	Yes	Yes	No	Yes	Metal
Page	No	No	No	generally	None
Polk	Yes	Yes	No	sometimes	"Lyle"
Tama	Yes	No	1 quarry	Yes	Steel
Webster	...	Yes	...	Yes	Metal
Kansas:					
Chautauqua	No	No	Yes	Yes	On poles
Kingman	Yes	Yes	No	Yes	......
Logan	abundant	No	No	No	Wood
Republic	not developed	No	No	Yes	Cypress
Kentucky:					
Christian	...	none	Yes	Yes	None
Greenup	Yes	No	Yes	No	......
Harlan	Yes	Yes	No	No	None
Henderson	Yes	Yes	No	Yes	None
Nicholas	No	No	Yes	Yes	None
Perry	Yes	Yes	Yes	in summer	None
Trimble	Yes	Yes	Yes	some	None
Maryland:					
Talbot	Yes	No	No	Yes	Cast iron
Montgomery	No	No	No	Yes	......
Michigan:					
Alger	No	No	Yes	Yes	"Indestructible"
Berrien	No	No	No	Yes	Steel
Calhoun	Yes	Yes	No	No	Steel
Luce	Yes	Yes	Yes	Yes	"Early"
Macomb	No	No	No	...	Wood
Otsego	Yes	No	Yes	Yes	None
Ottawa	Yes	No	No	Yes	Concrete post
Van Buren	Yes	Yes	No	Yes	Steel (Galion)
Minnesota:					
Anoka	Yes	No	No	Yes	Metal
Cottonwood	Yes	Yes	No	Yes	Steel
Crow Wing	Yes	Yes	No	some	Metal and wood
Goodhue	...	...	...	Yes	"Lyle"
Grant	Yes	Yes	No	No	None
Isanti	No	limited	No	No	Wood
Itasca	Yes	Yes	Yes	Yes	Metal and wood
Martin	Yes	Yes	No	Yes	"Lyle"
Nicollet	Yes	Yes	Yes	Yes	"Lyle"
Redwood	Yes	Yes	some	in part	Steel
Roseau	scarce	scarce	Yes	Yes	Metal
Todd	Yes	Yes	Yes	Yes	......
Mississippi:					
Alcorn	Yes	Yes	...	No	......
Missouri:					
Callaway	...	...	Yes	No	Painted metal plate
Camden	Yes	Yes	Yes	Yes	Painted board
Carroll	Yes	No	No	Yes	None
Clay	No	No	Yes	fair	On poles
Douglas	Yes	Yes	Yes	No	Pine boards
Lincoln	Yes	Yes	Yes	Yes	Wood
Miller	Yes	Yes	Yes	part	None
Mississippi	No	No	No	...	None
Polk	Yes	Yes	Yes	Yes	None
Ste. Genevieve	Yes	Yes	Yes	main ones	Painted oak and stone
Washington	Yes	Yes	Yes	Yes	None
Montana:					
Carbon	...	Yes	...	in summer	Wood
Gallatin	Yes	Yes	Yes	Yes	Steel and wood
Granite	...	Yes	Yes	1 good weather	Wood
Madison	Yes	Yes	Yes	Yes	Recessed metal
Yellowstone	Yes	Yes	Yes	No	Metal
Nebraska:					
Keyapaha	Yes	Yes	No	No	Steel
New Jersey:					
Burlington	Yes	Yes	...	Yes	......
Gloucester	Yes	Yes	No	being built	Enameled
Mercer	Yes	Yes	Yes	...	Metal
Morris	Yes	Yes	Yes	Yes	Wood and iron
Passaic	Yes	No*	Yes	Yes	Wood and iron
Salem	No	No	No	Yes	......
Somerset	Yes	...	Yes	...	4 :30″ stenciled boards on wd. posts
New Mexico:					
Luna	Yes	Yes	No	very sandy	Painted
New York:					
Cayuga	Yes	Yes	Yes	...	Board on cedar post
Chautauqua	No	No	No	Yes	None
Cortland	No	No	No	Yes	......
Franklin	Yes	Yes	Yes	Yes	......
Onondaga	Yes	Yes	Yes	Yes	None
Orleans	No	No	Yes	Yes	By Auto Club
Scuyler	Yes	Yes	No	Yes	Steel and wood
Ulster	Yes	Yes	Yes	Yes	Wood boards and concrete posts
Washington	Yes	Yes	Yes	Yes	All kinds
Ohio:					
Brown	...	...	Yes	Yes	None
Carroll	Yes	Yes	No	No	......
Coshocton	Yes	Yes	Yes	Yes	Aluminum
Franklin	Yes	Yes	Yes	Yes	Metal signs, concrete posts
Gallia	Yes	Yes	limited	Yes	By State Department
Highland	part	Yes	Yes	Yes	None
Huron	No	No	No	Yes	Concrete posts
Madison	No	No	No	Yes	......
Muskingum	Yes	Yes	Yes	Yes	Metal
Sandusky	Yes	Yes	Yes	mostly	......
Scioto	Yes	Yes	No	Yes	Drilled signs
Shelby	No	No	No	Yes	Iron
Summit	Yes	Yes	No	Yes	None
Wood	No	No	Yes	Yes	......

AVAILABILITY OF ROAD MATERIALS (Continued)

County & State.	Are there within the limits of the county adequate supplies of an acceptable quality of			Are Roads suitable for hauling these by motor truck?	Kind of road markers or signs used.
	Sand?	Gravel?	Crushed Stone?		
Oklahoma:					
Bryan	Yes	...	Yes	No	......
Garfield	Yes	Yes	No	Yes	Paint telegraph poles
Harper	Yes	No	Yes	Yes	Wood
Kingfisher	Yes	No	No	Yes	None
Kiowa	Yes	Yes	No	Yes	None
Major	Yes	No	in west half	Yes	......
Okmulgee	No	No	No	Yes	None
South Dakota:					
Deuel	Yes	Yes	Yes	Yes	Metal and wood
Tennessee:					
Franklin	Yes	Yes	Yes	Yes	None
Greene	Yes	No	Yes	Yes	None
Lawrence	No	No	Yes	Yes	None
Monroe	No	No	Yes	Yes	White oak
Unicoi	Yes	Yes	Yes	Yes	None
Union	No	No	Yes	some roads	None
Texas:					
Taylor	Yes	Yes	Yes	Yes	Various
Vermont:					
Windham	Yes	Yes	No	No	......
Washington:					
Adams	No	Yes	Yes	...	Steel
Columbia	No	Yes	Yes	Yes	State signs, wood
Douglas	Yes	Yes	Yes	Yes	State signs, wood
Garfield	No	No	Yes	some	State signs, wood
Grant	Yes	Yes	Yes	Yes	State signs, wood
Kittitas	Yes	Yes	Yes	Yes	Wood
Okanogan	Yes	Yes	Yes	Yes	Wood
Pend Oreille	Yes	Yes	Yes	Yes	Metal
Pierce	Yes	Yes	Yes	Yes	Wood
Snohomish	Yes	Yes	none used	Yes	Various
Walla Walla	No	Yes	Yes	Yes	None
Whatcom	Yes	Yes	No	Yes	......
Whitman	Yes	Yes	Yes	not from pit	Wood
West Virginia:					
Barbour	Yes	No	sandstone	Yes	None
Grant	Yes	Yes	Yes	most	......
Mineral	No	Yes	Yes	Yes	None
Monongalia	No	No	No	...	......
Raleigh	No	No	Yes	No	None
Wisconsin:					
Adams	little	little	No	...	State standard
Douglas	Yes	Yes	No	small trucks	Metal
Grant	No	No	Yes	Yes	State standard
Juneau	No	No	...	...	Metal
Kewaunee	Yes	Yes	No	Yes	State standard
Monroe	No	No	small amount	No	State standard
Outagamie	No	small amount	small amount	Yes	State standard
Ozaukee	Yes	a little	Yes	part	......
Polk	...	...	...	...	Enameled
Rock	Yes	Yes	Yes	Yes	Wood
Sauk	some	some	Yes	Yes	None
Shawano	Yes	Yes	Yes	some	......
Walworth	No	...	...	...	......
Washburn	Yes	Yes	Yes	Yes	......
Wyoming:					
Platte	...	...	...	...	Painted posts

*Except for concrete.

(*Continued from page 317.*)

material; and because of the lack of importance of some of the projects, bonds for them will not be approved.

The secretary of the Tennessee State Highway Commission writes: "The road program has been curtailed by the high price of labor, shortage of cars, and failure to sell county securities, bonds and warrants."

New York.—"Our entire program is very much curtailed by conditions due to the war. Prior to 1916 the state had been constructing improved state and county highways to the extent of about 900 miles per year, our total expenditure for construction and maintenance running as high as $15,000,000 to $17,000,000."—I. J. Morris, secretary of Highway Commission.

James Allen, state highway commissioner of Washington says: "The road program of this state has been curtailed to a certain extent by the high cost of labor and materials, the scarcity of labor and the lack of adequate transportation facilities. The state's road program has been carried forward to approximately 75 per cent of what would have been accomplished under ordinary conditions."

Ohio.—H. L. Hastings, chief clerk of Highway Department: "The above is in accordance with our proposed program. We cannot tell what curtailment will result from war conditions."

Oklahoma.—State Engineer Max L. Cunningham says that the road program is curtailed by transportation difficulties.

Virginia.—G. P. Coleman, state highway commissioner: "In certain sections of the state our work will be very much curtailed on account of scarcity and high price of labor. This will be more than made up, however, by the necessity for pushing the construction in other sections of the state."

Maine.—Chief Engineer of the Highway Commission Paul D. Sargent says: "We shall spend the usual amount if we can get labor to do the work. Mileage will be curtailed on account of high prices."

Arizona.—T. F. Nichols, office engineer, State Highway Department: "The bond issues have been postponed in order to assist the Liberty loans."

Connecticut.—C. G. Nichols, chief clerk of Highway Commission: "Construction work will be confined entirely to the trunk lines."

New Mexico.—Governor W. E. Lindsey says that the road program in that state is not curtailed in any way by conditions caused by the war.

New Hampshire.—F. E. Everett, state highway commissioner: "On account of labor conditions, etc., it is doubtful if 50 per cent of the above can be expended. This means that the remainder will lie over as a balance for future work."

John N. Edy, assistant engineer of Montana State Highway Commission, writes that some of the counties show a tendency to curtail their expenditures somewhat on account of war conditions, but that the estimates given by him are reasonably probable.

TRAFFIC LAWS AND HIGHWAY MAINTENANCE AND CONSTRUCTION

Wheel Loads Supportable by Different Soils—Diminishing Unit Pressure—Limiting Truck Weights—Width of Tires—State Requirements.

By CHARLES CARROLL BROWN.

The paper on traffic regulation, which was given at the St. Louis convention of the American Road Builders' Association by W. A. McLean, deputy minister of highways of Ontario, was fully up to the high standard set by the author in previous papers of his. It considered the subject from many points of view and gave rise to much discussion, which crystallized into a resolution calling for the appointment of a committee to confer with state highway authorities, manufacturers and users of vehicles and work out a definite system of regulations of traffic, covering all the points requiring such attention, such system to be recommended to the various states as rapidly as it is worked out, that the laws and rules promulgated may be as nearly uniform as possible.

WHEEL-LOADS.

Regarding the weights to be allowed for wheel-loads, the paper presented some data as a basis for their determination. It was stated that gravel would carry 8 tons per sq. ft., compressed sand 4 tons, good firm clay 4 tons, well-drained clay 2 tons, wet clay 1 ton, quick-sand or yielding soil ½ ton. It was asserted that the load is transmitted from moving wheel to soil surface through the stone crust placed on top at an angle of about 30 deg. with the vertical, and that this must be considered as well as the bearing power of the soil.

If wheel-loads are too great to be carried on the materials in the soil over which the road is to be built, a crust (of stone in some form) must be supplied and increased in thickness and strength so that it can distribute the load over the soil and reduce it to the bearing strength of the soil. That the bearing strength of the soil to be assumed must be the lowest which it ever attains on account of absorption of moisure, disturbance by frost, etc., is evident, and the stone crust must be designed for that minimum strength, even if it lasts for but a small portion of the life of the road.

Assuming for purposes of computation a 6-ton truck with 4 tons on the rear axle and a 6-inch tire, the tire pressure per inch width of tire is very nearly the maximum allowable under Ontario regulations, 650 lbs. Some of the United States put the maximum pressure at 800 lbs. per inch of tire width; also 12-ton and 21-ton trucks are used. It has been determined approximately that a stone crust 2½ inches thick will distribute the load over a gravel soil sufficiently to prevent yielding. These figures are extended in the following table to the different kinds of soil above named and to cover the three weights of truck:

	Thickness of stone crust necessary to carry load on rear wheels for		
Kind of Soil.	6-Ton Truck. Inches.	12-Ton Truck. Inches.	21-Ton Truck. Inches.
Gravel	2½	4	6
Firm sand	5	6	10
Drained clay	8	10	14
Wet clay	12	16	22

The combined influence of maximum wheel-load and kind of soil on the design of a macadam road is evident, and the necessity of some assumption of maximum wheel-loads before the design is made is very evident.

The same principles underlie the design of pavements with concrete base, monolithic brick and stone block pavements, etc., and economy of design, construction and maintenance demand the close coordination of weight and speed of traffic and design of pavement.

Discussion of the question of allowable wheel-loads on trucks and trailers brought out statements that steel tires are the most destructive of hard pavements, and it may in most cases be assumed that the requirement that all heavily loaded wheels shall have rubber or other like resilent tires will limit sufficiently the wheel-loads, the limitations of economy of maintaining the resilient tires being sufficiently definite to keep the maximum wheel-loads within the limits of economy in road surface design.

It was also asserted, and again denied, that the automobile-designing engineers could now state what is the most economical capacity of motor trucks. The assertion is doubtless made on the basis of the determination of the most economical capacity for a certain service or class of services. The denial is likewise based on the inability of engineers to design a truck which will be equally efficient for all classes of service, as a truck which is ample for one class must have much greater power for another; or a truck which carries economically a certain load in one service must have its capacity greatly enlarged to be economical in another service.

The fact is admitted, in any case, that there is a capacity of truck which is the most economical one for each class of service, and the maximum economical capacity for any service is that which the road-designing engineer wants to know.

Of course the exceptional use must be ruled out of this consideration. If a man wants to move a house down the street, he must prepare the street to carry the load by distributing it over the area to keep it below the maximum fixed in making the design. Likewise, if one man wants to make some special use of motor transportation he cannot require that the roads shall be constructed strong enough for his use. They must be built for the general benefit of traffic and as economically as possible for that traffic, and the special user must so distribute his load, by special means, as to keep the wheel-loads down to the maximum used in designing the road.

It is really not certain as yet what is the maximum economical truck load for any service. We have not had roads good enough for the development of all sorts of truck service. The design of the road for the maximum load must therefore be held back for future developments, and the limitations of funds and of foresight of designers will probably keep the roads somewhat under, rather than over, the strength which may be required of them by traffic which will be developed on account of their existence. Future reconstruction is often more economical than present construction on a design beyond the standard requirements of the present day. This has been demonstrated many times in the history of road and railroad construction. The only danger is in the application of the argument against the construction of roads of high class, demonstrated as necessary in a well-traveled section, in a section which bad roads have kept from development and which is only waiting for the good road to spring up to the level of its more progressive neighbors. This misapplication of the principle has caused the loss of millions of state funds in states whose road officials probably knew better, but who were prevented from applying their knowledge by those who controlled the purse strings.

Another solution of the wheel-load problem that was suggested is the multiplication of wheels, thus distributing a large truck or trailer load over two or more-wheeled trucks so as to reduce the weight on individual wheels to the maximum that is reasonable from the point of view of the road designer. So far, this has resulted in multiplication of trucks or trailers, but there seems to be room for still better designs of wheel bases than any yet offered.

The maximum French truck was said to weigh 7 or 8 tons loaded and 3½ tons empty, which is quite a saving to the road over the American maximum of say 12 to 15 tons loaded.

The usual soil will carry practically any weight of load which can be carried over it in dry weather, or when solidly frozen, as in northern winters. However, the road must be constructed to carry the loads during fall rains, and especially spring rains, and the breaking up of frost. In Michigan, traction engines and similar heavy vehicles are kept off the highways in March, April and May, except by permission and under strict regulation by the highway department, and the maximum load that can be carried in a vehicle is reduced 50 per cent when the roads are softened by rain or by frost coming out.

It is evident that the regulations regarding wheel-loads must be as uniform as possible throughout the country. At the same time it must be recognized that conditions differ extremely, and a set of regulations for Louisiana, for example, would not have much, if any, application to Nevada. But the vast majority of population is in states with reasonably uniform conditions, and it will be possible to develop regulations of great uniformity in a large majority of the states.

The bridge problem is one which enters as a complication, and in the poorer and less developed states the strength of the bridges will be the determining factor, rather than the quality of the road surfaces. The same is true, though probably to a less extent, of the less developed sections of each state.

The width of tire is an important factor in the regulation of wheel-loads, especially with steel tires. In Ontario this is limited by the requirement that the maximum load shall not exceed 650 lbs. per inch of tire width. In Great Britain the hard tires are varied according to diameter, also, and there is a variation in width from 5 to 15 inches on account of the combined influence of wheel-load and wheel diameter. The Massachusetts requirement is a maximum of 800 lbs. per inch of tire width. Trailers, whose steel-tire wheels meet the requirement, are doing incalculable damage to granite block pavements in Worcester, Mass., according to street superintendent Rhodes, largely because the speed is too great.

The increase in width of tire does not have much effect in distributing the load over hard pavements, because the crown of the pavements is such that the wheels bear largely on the rim of the steel tire. The same difficulty was reported by Mr. Neal from North Carolina. In building an asphalt macadam road the materials were hauled over the completed portion of the road in a truck with steel tires. The result was that the first part of the road was worn out in the process of building the more distant section. The tires failed to fit the curve of the crown and the rims of the wheels cut into the surface. A second truck had the rims beveled in an attempt to fit the crown. The destructive effect was emphasized, of course, whenever the truck turned out to pass other traffic. Possibly the destruction was partly due to overloading the truck. Putting on rubber tires stopped the difficulty, by softening the tire surface and by keeping down the load on the truck to the capacity of the softer tire. With double rubber tires but one part of the tire is in full contact with the road if the truck travels on the crown of the road. The tires are in better bearing if the driver always keeps on the right side of the road.

State Requirements as to Vehicle Weights.

	Maximum weight on			
	Vehicle	One axle	One wheel	per inch width of tire
City or State.	tons.	tons.	tons.	lb.
Chicago, Ill.	15	12	6	1,000
New York State	14	9	..	800
Oakland, Cal.	14	..	..	800
New Jersey	12½	..	..	800
Pennsylvania	12	9	..	750
Massachusetts	14	..	..	800
England	12	9	..	840

The above table is made from data given by E. W. Stern in a paper before the American Society of Municipal Improvements. In Oakland, Cal., and in Massachusetts the weight per inch of tire width does not apply to hard pavements. In England the weight on a trailer axle is limited to 4 tons, the weight of the empty vehicle is limited to 5 tons, and the combined weight of empty motor and trailer is limited to 6½ tons. The 840-lb. weight per inch of tire is for wheels 3 ft. in diameter. For larger wheels the allowable weight is increased 9 1-3 lbs. per inch of increase in diameter. For smaller wheels the allowable weight is reduced 18 2-3 lbs. for each inch of reduction in diameter.

The State of New Jersey has done much work on this problem. In the discussion of Mr. Stern's paper is a table giving the proposed relations between speed, weight and diameter of wheel in which the permissible load on rear wheel is given, ranging from 565 lbs. on a 2-in. single tire with 32-in. wheel traveling at 20 miles an hour, to 8,625 lbs. on a 7-in. double tire with a 42-inch wheel traveling at 10 miles an hour.

(*To be continued.*)

PRINCIPLES OF ROAD CONSTRUCTION

Selecting Paving Material—Grade—Width—Thickness—Drainage—Foundations—Joints—Cushion Course—Finishing the Surface.

Annually since 1911 progress reports have been submitted by the "Committee on Materials for Road Construction and on Standards for Their Test and Use," of the American Society of Civil Engineers. At the annual meeting in January of this year this committee submitted its final report, which occupies 82 pages of their proceedings. The report presents first the general conclusions of the committee, which are followed by discussions of the various kinds of pavements and highway surface treatments that are in regular use at the present time; this including not only the more permanent constructions, but also earth, sand-clay and gravel. Following this is given a list of terms used in describing paving materials and methods, with definitions of each. An appendix gives a form of record for data concerning the use of highway materials, and another appendix describes the methods recommended for performing tests of non-bituminous materials, while a third gives the methods recommended for testing bituminous materials.

Because of the increasing number of those interested in the subject, as well as for the purpose of making the final report comprehensible, the committee has included conclusions or statements that may seem primary or trite to highway experts. It also has thought wise to submit in the report principles underlying the drafting of specifications. The committee "believes that competent highway engineers may meet successfully the demands of any particular case by following these principles and eliminating the variables, necessarily left therein, in order to express conclusions of general application, after proper consideration of the local factors affecting them. However, it does not believe that these conclusions as to specifications will offset a serious lack of knowledge or experience in highway engineering or furnish a discriminating ability otherwise lacking."

In the introduction to the report the committee gives a list of investigations which it thinks should be made and expresses the hope that some authoritative data may in some way be secured at an early date which will throw light on the matters referred to. The committee "is impressed by the importance of the factor of costs, both as to construction and maintenance of highways, and of the need for comparable records of such data. The present situation in this respect is unfortunate, there being found available but few records of costs uniformly or logically compiled. Hence, comparisons are difficult if not impossible."

As showing the general views of the committee and their method of handling the subject, the following abstract of its "General Conclusions" is given. Limitation of space makes it impracticable to attempt even to abstract the detailed discussion of materials and methods for the several individual classes of pavements.

ABSTRACT OF GENERAL CONCLUSIONS.

Selecting Material.—One of the greatest problems for highway engineers is the proper selection of the particular material and form of construction that will most efficiently meet the conditions of any particular case. Selection of the kind of crust or pavement should be based on the following factors: First cost, maintenance cost, annual cost, ease of maintenance, durability, cleanliness, tractive resistance, slipperiness, favorableness to travel, sanitariness, noiselessness, and appearance. The special value of each of these may be estimated in each case under the local conditions of traffic, surroundings, climatic conditions, and physical and financial resources, as to both construction and maintenance, with proper regard for probable or possible changes in these circumstances.

Experience has demonstrated the value of a traffic census taken both preliminary and subsequent to the construction of a highway. It is one of the most important factors in deciding the selection of type of construction best suited to local conditions, considered from the standpoints of both economy and efficiency. Census counts on any highway should be supplemented by counts on cross and parallel highways. Such a census should not be the sole basis of selection, but should be considered as a guide in determining the value of the type to be adopted. Speed as well as weight of vehicles should be recorded.

Grade.—Choice of material or methods of construction may be affected by the road grade. Conservative practice fixes the maximum limits for satisfactory results with grades as follows:

Kind of Roadway.		Maximum Grade, %
Asphalt block		8.0
Bituminous surfaces		6.0
Bituminous concrete		8.0
Bituminous macadam		8.0
Brick	cement filler	6.0
	bituminous filler	12.0
	"Hillside" block	15.0
Broken stone		12.0
Cement-concrete		8.0
Gravel		12.0
Sheet-asphalt		5.0
Stone block	cement filler	9.0
	bituminous filler	15.0
Wood block		4.0

The minimum grades allowable will depend on local conditions such as climate, type of construction, traffic, soil, etc. Except for roadways on fills, where the outside edges of the shoulders are at least 2 ft. above the level of the adjacent ground or where the roadway is laid over sand that never becomes water-logged, the grade of the road should never be less than 0.5 per cent. Under most favorable conditions, 0.25 per cent has sometimes given satisfactory results, but should be used in exceptional cases only.

Width.—In view of the continuous and rapid increase in number of vehicles and size of loads using the highways, economy requires designing highways with proper consideration of further increase. Where motor traffic comprises the largest part of that using the highway, the unit width of traffic lines should be taken as 9 or 10 ft.

The edges of bituminous pavements need protection, and sudden transition from the pavement to any soft shoulder material should be avoided by means of extra width, or by cement concrete or other edges, or such reinforcement of the shoulder material as may be necessary.

The width of roadways of rigid material should be at least equal to what would be prescribed under local conditions for a less rigid surfacing. For single-track roadways the width of pavement should be not less than 10 ft., and for two lines of traffic not less than 18 ft., unless exceptionally durable shoulders are provided. In a street or alley the width will originally be determined by the necessary location of the curb.

Too narrow a roadway causes a concentration of traffic that is apt to produce excessive wear of materials that would be suitable and efficient if the traffic were more generally distributed over it. Any tendency toward concentration of traffic in too narrow an area, as at sharp bends, should be avoided as far as possible by adjustment or separation of lines, adjustment of width, of crown or of slope of roadway.

Too great width results in unnecessary first cost and interest charges, and also maintenance and cleaning costs. In the case of pavements that require at least a minimum amount of travel to preserve the surface in good condition, excess of width may result in disintegration of unused areas which may spread rapidly over the whole pavement.

Thickness.—Determination of the thickness of a road crust or pavement should be based upon the character of the foundation and the weight of the traffic, with proper consideration of future increases in the latter. An absorbent sub-grade material likely to become soaked with water may require a thicker slab than otherwise, or even the addition of an artificial foundation in order to disperse the stresses properly from pavement to sub-grade. In some cases unusual thickness may be desirable with the use of a minimum of cement, not only for reasons of economy, but also to avoid the effects of frost. A thickness for a concrete slab exceeding 8 inches should be determined upon only after thoroughly considering the possibility of all other means of meeting the conditions, such as improving the sub-grade.

Variations in thickness of such surfacings as sheet-asphalt invariably result in non-uniformity of wear, and the same may be true of non-uniformity in thickness of other pavements as well.

Approved practice establishes the limits shown in the accompanying table for the extremes of thickness for the various layers of pavement or road crust:

Drainage.—No matter what the kind of pavement or crust, under-drainage should be provided necessary to keep the sub-grade free from moisture. Also there

Limits of Thickness for Pavement Layers.

Kind of Roadway.	Thickness of artificial foundation* (ordinary), in inches	Thickness of sand cushion or binder course in inches.	Thickness of wearing course, in inches.
Asphalt block	5 to 8	....	2 to 3½
Bituminous surfaces	4 to 8	....	¼ to ½
Bituminous concrete	3 to 8	....	1½ to 3
Bituminous macadam	3 to 8	....	2 to 3
Brick	4 to 8	¾ to 1½	3 to 4
Broken stone	3 to 8	....	2 to 3
Cement-concrete { One course	......	....	5 to 8
Cement-concrete { Two course	4 to 8	....	2
Gravel	4 to 8	....	2 to 4
Sheet asphalt	5 to 8	1 to 1½	1½ to 2
Stone block	5 to 12	1 to 2	2½ to 5
Wood block	5 to 8	0 to ½	3½ to 4

*Not including extraordinary provisions such as V-drains or "sub-base" courses.

should be provision for surface drainage. Storm-water reaching the roadway must be carried quickly and rapidly away from it to natural watercourses. Inlets, ditches, gutters, and culverts should be designed and placed so as to be least objectionable to users of the roadway and abutting owners, and to be most durable and least expensive under all conditions. A proper longitudinal grade for ditches and gutters is particularly important; also the cross-section of ditches, so that the sides may not slide in.

Under-drainage is, if anything, even more important where cement concrete pavement or foundation is to be used, because this cannot adapt itself to change in subgrade due to frost without cracking, as other less rigid pavements can.

The crown necessary for removing surface water to gutters or ditches should be a minimum from the point of view of traffic and wear, but some crown is necessary, varying with the type of surface. Smooth pavements should be given a very flat crown; and where the longitudinal grade is sufficient to allow the water to run freely the crown should not exceed 3 inches in a roadway 30 feet wide. The recommended practice is from 1/4 inch to 1/8 inch per foot for asphalt block, sheet asphalt, and wood block; from 1/2 inch to 1/4 inch for bituminous surfaces, bituminous concrete, bituminous macadam, and stone block; from 3/8 inch to 1/8 inch for brick; from 3/8 inch to 1/4 inch for cement concrete; from 3/4 inch to 1/2 inch for broken stone, and from 1 inch to 1/2 inch for gravel. The slope for shoulders, where these are of natural earth, is generally 1 inch per foot.

Sub-Grade.—Whatever the form of pavement, the subgrade should be well drained, thoroughly compacted, homogeneous and stable, even when an artificial foundation is to be constructed. Uniformity in composition and compaction, as well as evenness of surface, is far more important than is generally recognized. It may even be desirable to increase the sustaining powers of the natural foundation by placing between it and the artificial foundation a layer of sand, gravel, broken stone, or similar material. A concrete foundation should not be relied upon for bridging soft spots, but these should be dug out and other material substituted and thoroughly compacted.

Artificial Foundations.—Where the character of the traffic justifies the use of an artificial surface, it also demands a correspondingly strong foundation. Whether or not an artificial foundation is necessary will depend upon local conditions; but in any event the greatest efficiency possible should be obtained from the natural foundation. Foundations of ample strength and permanence are especially necessary where the wearing surface is to be of cement concrete or block pavement, owing to their inherent lack of elasticity Local conditions may occasionally justify omitting the artificial foundation for brick pavements where the natural foundation material can be made reasonably permanent, where brick is relatively low in price, and where only light traffic is expected.

The proportioning of materials for cement concrete pavements should be made to conform to the needs and facilities of each case. Sometimes it is desirable to increase the mass at the expense of unit strength or for the sake of economy in cement.

Joints.—For the ordinary joints in block pavements, the materials and methods of filling should be selected so as to produce not only a surface that will retain to the utmost its imperviousness and the stability of the blocks themselves in place, but they should also, so far as practicable, conduce towards evenness of wear of the surface of the pavement. If the blocks are resistant to abrasion, but are inclined to round off at the edges of the upper surface under traffic, such filling of the joints is desirable as will reduce such rounding off. On steep grades, where some roughness of the surface may be desirable to afford foothold for animals, some openness at the top of the joint is desirable and the softer joint filters may be preferred.

As it is desirable to secure waterproof pavements, sand alone should never be used as a joint filler. A bituminous filler may be preferred to a cement grout filler on account of the lower cost of street opening repairs, the better foothold provided for horses, and the securing of a more elastic and less noisy pavement.

For cement mortar joints a mixture of one cement to one sand is recommended. Uniformity in mixing and care and skill in application are essential to success. To insure uniformity, there should be a constant agitation of the mixture up to the moment of its application.

For bituminous joint fillers, care must be taken to select materials which will not be too brittle in cold weather nor so soft in hot weather as to flow out of the joints. It is believed, although not yet positively proved, that the use of a bituminous mastic would be an improvement over bituminous material alone. One of the greatest difficulties with bituminous fillers of any kind is that of properly filling the joints, and great care must be taken to insure this.

Expansion-Contraction Joints.—Where expansion-contraction joints across a roadway at intervals are employed, the committee recommends the use of bituminous material and the abandonment of all forms of the so-called "armored" joints, because of the smaller interruption to the homogeneity of the road surface thus secured.

Cushion Courses.—Where a cushion course is used, its thickness should never be greater than that necessary to compensate for the unevenness of the surface of the concrete base and that in the depth of the blocks used, plus about one-half inch to produce cushioning effect. The use of a cement-mortar cushion gives a monolithic structure with perhaps greater strength, but less capable of absorbing shock without injury than where a sand or bituminous cushion is used, especially where bituminous joint filler is used.

A certain amount of loam in sand used for cushion may be of advantage in giving the sand a greater ability to resist displacement, but it should not be so loamy or fine as to prevent proper spreading and compaction, or to afford too great capillarity.

Finishing the Surface.—Pavements in which Portland cement is used for filling the joints or in the surface itself should be closed at least two weeks after completion.

As a result of numerous observations, the committee is convinced that, in a newly-completed pavement the variations from a straight edge or templet 8 ft. long should not exceed ⅛ in. for asphalt block, bituminous concrete, brick, cement concrete, sheet asphalt, and wood-block pavements, and ¼ in. for broken stone roads, bituminous macadam and stone block.

Manhole Heads and Rails.—In the case of macadam or bituminous pavements, the pavement should be laid about ⅛ in. higher than any manhole heads therein. The same should be done along street-car tracks where these are rigidly set; although the committee does not believe that a bituminous pavement should ever be laid between rails, and advises laying stone blocks or brick for at least 18 in. adjacent to the rails in the case of country highways, where the rails are not usually laid as rigid as in city streets.

BITUMINOUS AND BROKEN STONE BASES.

There are probably exceptions to almost any general statement relative to pavement conditions. The following letter from Harry E. Devereaux, city engineer of Eugene, Ore., describes conditions in bituminous pavements in that city on bituminous and broken stone bases that are at variance with those which Mr. Warren, in his letter of March 16th, described as those found in his experience:

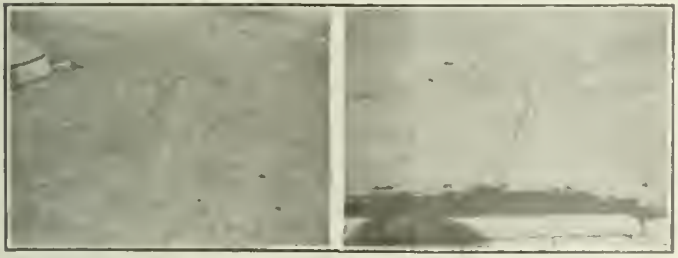
Editor Municipal Journal,
New York City.

Dear Sir:

The matter of cracks in pavements is very interesting to me and I have followed the discussions in Municipal Journal with much interest.

Contrary to Mr. Warren's statement on page 228 of your issue of March 16th, 1918, we have found that pavements on a black or rock base show more cracks than the same type of pavement on a concrete base. However, the cracks in the former rarely exceed 6 feet in length, while most of the cracks in the latter extend entirely across the roadway.

Possibly due in part to the small range of temperature here, cracks in either type of construction are more interesting than serious.



CRACKS IN PAVEMENTS ON BITUMINOUS BASE.

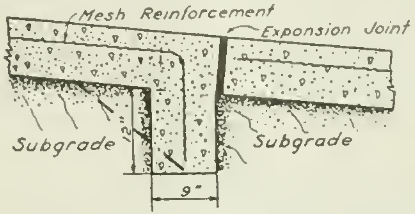
I enclose snapshots of Standard Bitulithic pavement on a crushed rock base laid in 1908 by the Warren Construction Co.

Yours very truly,
HARRY E. DEVEREAUX.

CONCRETE ROADS ON STEEP GRADES.

On both city streets and country highways it is generally very desirable to keep the grades below a limit of five per cent, where possible, but there are sections of the country and conditions of topography where a higher limiting grade must be permitted on some roads. On steep grades, water-bound macadam is found to wear so badly that some other construction is desirable. On the other hand, on the steeper grades the smoother pavements, such as those formed by the use of bituminous binders, are found to be too slippery, especially for horse-drawn traffic. Some counties have used granite block on steep grades, more to obtain a pavement that would not be too slippery for such grades than because the maximum wearing quality was desired.

Until quite recently New York State had limited its use of concrete pavements to five per cent grades, but it is now building them on grades as high as eight or nine per cent, under certain conditions. They consider it especially adapted to grades where there is heavy motor truck traffic. With any kind of traffic, however, on steep grades it is thought desirable to secure a fairly rough surface, and in order to obtain this, as little floating as possible is employed, since the result of excessive floating is to work all the coarse particles beneath the surface. In addition to this, the surface is broomed, which adds to the roughness and gives tires a better grip on the pavement. It is not believed that scoring or marking the pavement for this purpose gives a result which is commensurate with the cost.



ANCHORING CONCRETE PAVEMENT ON STEEP GRADE.

Also the use of coarse sand is recommended. Gravel is not generally desirable as an aggregate on steep grades, but where it must be used it should be crushed so that at least half of the particles are broken. If care is taken in selection of the aggregate, in permitting the coarse particles to remain at the finished surface, and in lightly brooming the surface, such a pavement is found to be no more slippery than newly-laid grouted granite block.

One difficulty experienced in laying pavement on steep grades is the tendency of the pavement to move down hill bodily, or for one slab to climb over the next lower one at the joint if the joint is not exactly perpendicular to the surface, or even to crush it at this point if the concrete is lacking in strength. In order to avoid this, H. Eltinge Breed, first deputy commissioner of New York State highways, has designed a joint which is now being tried out in work in that state, the idea of which is to anchor each slab to the subgrade at its lower edge so as to prevent its down-hill sliding. The illustration shows a cross-section of the lower edge of a slab so anchored. In this case, the anchoring projection would fail of its purpose if the sliding force were sufficient to shear it off along the line of the bottom of the slab. We would suggest that the length and consequently the strength of the line of shear might be advantageously increased by making the up-hill face of the projection inclined rather than vertical, making the projection wedge-shape and increasing the length of its base two or three times, with a comparatively small increase in the amount of concrete used. Such modification is indicated by the dotted line.

ECONOMY FROM LABOR-SAVING DEVICES.

The State Roads Commission of Maryland in its latest report says: "A number of labor-saving devices have been used to keep down the cost of the work as much as possible, and machinery such as graders, steam shovels and other improved equipment have been continually used to hold the work down to the least possible cost. Taking into consideration the excess cost of materials and labor, the work has been done at less cost than heretofore, due to the use of improved road machinery, trucks, etc."

FOR FEDERAL ENCOURAGEMENT OF HIGHWAYS.

The Highway Traffic Association of the State of New York on April 16th held a conference on a number of matters of importance in connection with highway construction, maintenance and use, with special reference to the present emergency, at which it was addressed by several prominent speakers and adopted resolutions, in an effort to bring matters referred to forcibly to the attention of state and federal authorities.

The speaker of the evening was S. M. Williams, president of the Highway Industries Association, who spoke on the topic "Highway Transportation Jeopardized." He referred in emphatic terms to the great necessity of highways at the present time and to the difficulties under which the construction and maintenance of them were being carried on, these including not only scarcity of labor, material and funds, but also embargoes and other federal discouragement. He expressed the opinion that the road work would proceed in spite of these obstacles, since the traffic shortage must be and will be met in some way and the increasing use of highways is essential thereto.

He was strongly in favor of the use of prisoners in the various states on road construction and maintenance, advocating the "honor" system as being beneficial to the prisoners themselves and an economy to the taxpayers as well as aiding in meeting the labor shortage for road work. Concerning the roads themselves, he referred to the importance of not overlooking the bridges, since the carrying capacity of any road was limited to that of its weakest bridge. Following Mr. Williams' address, the following resolutions were adopted:

Whereas: The transportation requirements of the United States, due to the war, can be only met by complete coordination of the carrying capacities of railroads, highways and waterways; and

Whereas: There has developed in the United States a tremendous increase in highway transportation, for the haulage of munitions, foodstuffs and essential supplies; and

Whereas: We recognize the necessity of a Federal wartime policy in respect to highway improvement, permitting the various states to immediately formulate a definite highway program; be it

Resolved: That the Highway Traffic Association of the State of New York urge upon the Federal Government and the State of New York the importance of adopting a program that will ensure adequate highway construction and maintenance, so that our highways may properly carry their share of the burdens of transportation; and be it further

Resolved: That we urge upon the President and the members of Congress the creation of a centralized federal authority to determine the highway policy of our government, with power to direct the administration of that policy.

Other speakers touched upon the desirability of a traffic tunnel between New York City and New Jersey; of the designation by the War Department of certain roads as military highways, to be maintained by the federal government; the use of prisoners of war on highway work; and the further extension of the motor truck parcel-post service; resolutions expressing the opinions of the society being adopted as follows:

Resolutions Re Military Highways.

Whereas: The War Department is using many highways for military purposes, and, in many cases, army vehicular traffic constitutes a large percentage of the total traffic, and,

Whereas: Some highways so used are rapidly worn by army truck traffic, and,

Whereas: The efficient maintenance of such highways is a necessity for the rapid and economic transportation of army supplies, be it

Resolved: That the Highway Traffic Association of the State of New York petition the Congress of the United States to enact the necessary legislation to permit the construction and maintenance by the United States Government of such highways as may be designated by the War Department as Military Highways.

Resolutions Re Prisoners of War.

Whereas: The number of prisoners of war to be transferred to the United States will probably rapidly increase during the progress of the War, and,

Whereas: The construction and maintenance of highways is of vital importance for the successful propagation of the War, be it

Resolved: That the Highway Traffic Association of the State of New York favors the maximum utilization of prisoners of war, in accordance with the provision of International Law, as labor for the construction and maintenance of interstate trunk highways and military highways under the supervision of the War Department of the Federal Government.

Resolutions Re Motor Truck Parcel Post Service.

Whereas: It has been demonstrated that proper utilization of the motor truck parcel post service will materially increase the food supply of cities and provide for quick delivery of farm products to city consumers, and,

Whereas: Such service can be conducted at a profit to the United States Government and successfully compete with railroad transportation on routes not exceeding one hundred miles in length, be it

Resolved: That the Highway Traffic Association of the State of New York petition the Congress of the United States to appropriate the sum of not less than five hundred thousand dollars for the extension of the motor truck parcel post service.

Resolutions Re New York-New Jersey Traffic Tunnel.

Whereas: The transportation of freight and the passage of vehicular traffic between the New Jersey terminals and New York City is at present inefficient, and the provisions therefore are inadequate, and,

Whereas: The New Jersey Legislature has signified by its passage of adequate legislation its willingness and desire to bear its proper share of the cost of construction of an interstate highway traffic tunnel connecting New Jersey and New York City, be it

Resolved: That the Highway Traffic Association of the State of New York favors the immediate construction of the New York-New Jersey highway traffic tunnel, and pledges itself to assist in securing the passage of the necessary legislation by the New York Legislature authorizing the construction of the interstate highway traffic tunnel.

BITUMINOUS CONCRETE IN MORRIS COUNTY, N. J.

The county engineer of Morris County, N. J., W. Hopkins, gave information concerning bituminous concrete construction in that county which was too detailed to include in the table in this issue, and which we give herewith.

Three kinds of this class of pavement were laid: Topeka, Warrenite, and Amiesite. The first was laid 34 feet wide, the second and third 18 feet wide. The first two were laid on 6-inch concrete base, for which the concrete prices varied from 75 cents to 90 cents per square yard. The Amiesite was laid on macadam base, six contracts being Telford with macadam foundation and three macadam without the Telford foundation. The last cost by contract from 48 cents to 80 cents, while three inches of macadam on six inches of Telford cost from 72 cents to 90 cents. The contract prices per square yard were as follows: Topeka—$1.00; Warrenite—four contracts, from $1.43 to $1.50; Amiesite—nine contracts, from $1.04 to $1.30. These prices include the surface only, without any grading, base, or other work. The amount of Topeka laid was 23,016 square yards, the amount of Warrenite, 47,373, and the amount of Amiesite, 144,479.

NAMING AND MARKING ROADS.

The county surveyor of St. Joseph County, Ind., Henderson McClellan, informs us that a new road map of the county has been prepared and all the roads have been named; and that as fast as money can be raised for the purpose, signs will be placed giving the names of the roads. Three hundred and six of such signs will be required.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

INCREASING THE USE OF HIGHWAYS.

It has been stated that there are now considerably more than four million motor vehicles in service in the United States, and probably one million more than there were last summer. This addition would naturally result in an increase by about 30 per cent in the use of the roads of the country. There seems to be a probability, however, that the use of highways by such vehicles will be increased over that of last year by a considerably higher percentage than this because of the more intensive use of the vehicles in service. One indication of this and a factor in producing it is the return-load campaign that is being conducted in a number of states, the object of which is to assist motor trucks in obtaining loads and diverting short hauls from the railroads as far as possible. Results in Connecticut, New Jersey and practically the entire strip of country between Boston and Philadelphia indicate that motor truck traffic this year throughout that district will be at least double what it was last year.

In addition to this, a number of highways will be used for delivering, from the manufacturers to the ports of embarkation, the army trucks that are being manufactured here for use in France. Also a large part and possibly nearly all of the motor cars manufactured this year, passenger as well as trucks, will be delivered over the roads instead of by rail as heretofore.

The above influences combined seem almost certain to add greatly to the number of vehicle-miles of travel this year, and also to increase the average load carried if the return-load movement is successful in insuring that trucks will not travel empty in either direction.

One result of this may be such a concentration of motor traffic along certain highways connecting manufacturing and shipping centers that these highways will be rendered unattractive to pleasure or tourist traffic, and such traffic will seek out and use other less direct routes. It is to be hoped these results will follow, since it would both reduce the congestion and constant delay to motor truck traffic, and also lessen to some extent the wear on the main highways used by such traffic. In fact, we suggest that drivers of pleasure cars may aid in the solution of the traffic problem if they will avoid these main trucking routes even before they are driven to do so by congestion of traffic on them.

RETURN LOADS BUREAU.

The idea of "return loads" bureaus is being adopted rapidly throughout the eastern states and has already been put into practical operation in a number of them. There would seem to be every reason why the general establishing of such bureaus should assist greatly in solving the short-haul traffic congestion, and therefore, entirely aside from any economies that may be affected, is a most patriotic move. This is the opinion of the Council of National Defense, and the Highways Transport Committee of that council is making an earnest effort to secure the establishing of such bureaus in all of the larger cities, and the smaller ones as well.

Return load service is already well established in Connecticut, and a meeting is to be held on the day that this issue goes to press with a view to organizing all of New England for this purpose. The prospects seem good for an active organization of such service in Massachusetts, Rhode Island and Connecticut, with close affiliation with New York City and later with the entire state of New York. At the request of the national Transport Committee, the Merchants' Association of New York City a few days ago appropriated $5,000 for the purpose of creating a return load bureau in that city. In New Jersey, bureaus had on April 1st been established at six cities, and it is expected that all of more than 10,000 population will soon be provided with such bureaus, the plan being promoted there by the State Council of Defense. The Council of Defense of the state of Ohio has recommended the establishment of such bureaus by chambers of commerce in all of the large cities; and the Chamber of Commerce of Philadelphia is expecting to operate such a bureau, if indeed it has not already been put into effect. Most of the steps referred to above have been taken within the past month or two (except that in the state of Connecticut), and the spread of the movement is so rapid that almost every day sees the establishment of one or several of such bureaus.

The general idea has already been described in Municipal Journal. Some person or organization in each city consents to serve as a clearing house for bringing shippers and truck-owners together. No responsibility is assumed by the bureau, and generally no charge is made for the service rendered. The so-called bureau in different cities consists of the town clerk, the commissioners, police station, motor truck club, Home Defense League, Chamber of Commerce, Van Owners' Association, etc. A plan commonly adopted is to have the individual or office acting as the return load bureau in each city, entered in the local telephone-book under "Return loads," so that either a local or long-distance telephone call can be made to the bureau without difficulty.

The chief difficulty so far has been to sufficiently advertise the idea so that all who can or should take advantage of it may not fail to do so. Considering that the entire movement is largely a patriotic one and that no one connected with the bureau is financially benefited in any way, it would seem that the daily papers should be willing to give publicity to the matter by frequent mention and possibly a continuous advertising until the existence and benefits of the return loads scheme is familiar to all.

COUNTY HIGHWAY RECORDS.

It is somewhat startling to learn to what an extent the county highway officials throughout the country fail to keep any adequate records concerning the road work which they perform, or at least to keep their records in such shape that they will be of any value except as mere statements of total expenditures. Several county officials have written us within the past few weeks stating that they cannot give any figures as to the cost or even amount of road work done in their counties last year because no records were kept from which they can furnish the information.

It is not merely to satisfy curiosity that cost-data should be kept, but the future development of a road system cannot be made intelligently, effectively and economically unless definite information is at hand concerning work of the past and the results obtained in the way of service rendered and the unit cost of such service. This is especially important at this time when the rapid growth of highway traffic demands improvement in construction and maintenance methods. A most important factor in deciding upon methods to be employed is the financial one of keeping total cost at a minimum; and if there are no records to show the cost of the several methods employed in the past, no reliable estimate can be made on their effectiveness and economy for the future.

It is not enough that figures should be available for one or two sections of the country or even one or two counties in each state. Each district of the country has its own problems of sub-grade, drainage, construction materials available, weather, traffic, etc., and the various combinations of these give complex problems which are the same in scarcely any two sections of the country.

Aside from this, without detailed record of the construction and maintenance of each road and the traffic carried by it, treatment of other roads or future treatment of this road will each succeeding year be a mere matter of guess work and the success or failure of the road will be a matter of chance, especially under the ever-varying conditions caused by rapid traffic development.

No man can succeed in any line of endeavor if he does not learn and profit by experience. Progress in county road work will be delayed indefinitely by failure of county officials to keep definite, detailed and intelligent records of their experiences in all branches of the operation of the roads under their charge.

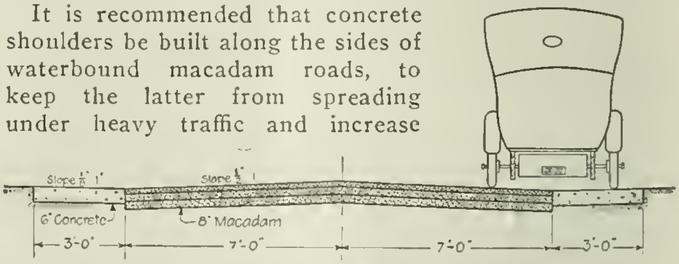
ROAD MAINTENANCE AND AUTOMOBILE FEES.

The maintenance of highways in Maryland is becoming a serious problem, and Frank H. Zouck, chairman of the State Road Commission, has made an appeal for immediate action in the matter. The present system of state roads in Maryland cannot be duplicated at this time for less than $40,000,000, and he considers that it would be a crime to allow them to deteriorate for want of the necessary funds for their upkeep.

Freezing and thawing and very heavy traffic are the most serious factors in road destruction in that state. Alternations of freezing and thawing weather seem to be more frequent in Maryland than further north, where the roads stay frozen, or further south, where they freeze less frequently. This is not so detrimental to concrete and asphalt roads as it is to waterbound macadam and gravel, of which there is a considerable mileage in that state.

Immediately after the construction of the present good roads the traffic over them increased in both volume and weight, the latter doing the greater injury. Mr. Zouck maintains that some limit should be placed upon the weight of trucks permitted to use the roads. It has been suggested that macadam roads should be made thicker to carry the heavier loads; but no matter how thick such a road be made, says he, wherever traffic goes over it with sufficient weight per inch of tire surface to cause one stone to grind against another it produces internal wear. A surface which has been compacted by a ten-ton roller, giving a pressure of 400 pounds per inch of wearing surface, will not long endure a traffic whose wheels exert a pressure of 800 pounds or more per inch.

It is recommended that concrete shoulders be built along the sides of waterbound macadam roads, to keep the latter from spreading under heavy traffic and increase the width. No new waterbound macadam roads are being built in Maryland, but only those of a higher type. In 1917 the state licensed 4,156 trucks with solid tires, receiving therefor $40,337, an average of $9.70 per truck. Twenty per cent of this goes to the city of Baltimore, and the license tags and expenses incidental to the office of the commissioner of motor vehicles require 36c more, leaving only about $7.40 per truck for maintenance. If the average yearly mileage of a truck is 7,500, this gives less than one-tenth of a cent per mile per truck for maintenance. Of the toll roads entering Baltimore city, the last to be taken over by the state charged $1.80 a round trip. This was used by many hucksters, who made but one trip a week. Some hucksters are now making four or five trips a week with one-ton trucks and paying a license of $8.00 a year, or about one-fiftieth of the cost per mile that they paid the old toll road. And with this the toll road was never a paying proposition.



PROPOSED ADDITION OF CONCRETE SHOULDERS TO MACADAM ROAD.

A macadam road in Baltimore county which was in fair condition was entirely destroyed by one truck in the spring of 1917, $8,000 being required to restore it to its original condition. Another road in Carroll county was so damaged by a large truck hauling lumber, carrying as much as 7 tons at a time, that it cost over $7,000 to repair the road after this hauling ceased. These instances show that certain heavy trucks are causing the State Highway Department an expenditure several hundred times as great as the fees which they pay.

The legislature of 1916 fixed, as the amount available for road maintenance in Maryland, the receipts from the automobile licenses, and at the time of the latest report this had resulted in a maintenance deficit of $747,753. As it is absolutely impossible to maintain the roads with the license fees, and as the ever-increasing motor truck traffic will undoubtedly destroy them utterly in a very short time if they are not properly maintained, the problem confronting the commission is a serious one.

The WEEK'S NEWS

State Highway Events in Iowa, Ohio and New York—Erie's Flood Prevention Work Halted by Court—Federal Health Service Tests Vaccines—Health Officials of Country Help Food Conservation—Government's Fuel Preference List—Fires in Pawtucket, R. I.; St. Nazianz, Wis.; West Tampa, Fla., and Lancaster, Pa.—No Pay for West Virginia Councilmen—Strike in Baltimore's Street Department.

ROADS AND PAVEMENTS

Year's Highway Expenditures in Iowa.

Des Moines, Ia.—According to the latest statement by the state highway commission, during 1917 the counties and townships of Iowa spent about $15,000,000 for roads and bridges. Of this amount $7,728,670 was expended for roads and $7,466,797 for bridges and culverts. The total road and bridge expenditures for 1917 exceed those of 1916 by $828,420; those of 1915 by $1,639,859, and those of 1914 by $3,564,476. These increases may not be exactly correct, owing to the fact that county engineers' records for the year 1914 especially are not so accurate or so complete as during the past two years. Figures for 1916 and 1917, it is believed, will bear the closest scrutiny for accuracy and completeness. As a result of four years of operating under the cost accounting system adopted under the present road law, Iowa today knows exactly what she is spending on her roads and bridges. She has placed her whole business of road and bridge building somewhat more nearly upon the plane upon which successful private business is being operated. One of the highly satisfactory results of this comes in the positive assurance that a larger and constantly increasing proportion of her expenditures each year is for more permanent roads and bridges. In this same connection, it is worthy of note that while in 1913 and 1914 it was possible to get reports on township expenditures from but a small proportion of the townships in the state, the 1917 report is based upon a total of 1,521 townships out of a total of 1,613. Of the total expenditure for bridges and culverts on both the county and township road systems, it is stated, the percentage of money spent for work of a permanent nature amounted to 63.1 per cent or practically two-thirds of the total. The proportion of the expenditure for roads used for permanent work was 49 per cent as against 40 per cent in 1916, 41.4 per cent in 1915 and 25.3 per cent in 1914.

Ohio's Prison Road Camp.

Columbus, O.—About 14 miles from Cambridge, in Guernsey county, the state has built a new camp to house prisoners to be employed on road work. It is the state's first experiment in the use of convict labor on highway work, and state and prison officials and contractors say it is proving valuable at the very outset. From now until late summer prisoners from the penitentiary at Columbus and the reformatory at Mansfield will be sent to do a rush job of national highway paving to prepare the historic pike for the passage of 43,000 government trucks which must go through Ohio on the way to the seaboard. Seven and a half miles of very difficult highway and fourteen miles in Muskingum county are to be paved. Gov. James M. Cox declared the situation an emergency and the state determined to put convict labor on the part of the work to be done in this county and speed it by force. Fifty-five negro prisoners were sent in one batch and are working in a quarry a quarter of a mile off the road getting out rock that is to be used on the highway. The pavement will be water-bound macadam. Edgar Foy of Chillicothe, superintendent in charge for the contractor, H. Renick of Williamsport, says that the convicts make good workmen. All the men say they like the work. Most of them are men with records entitling them to parole and pardon considerations at not distant dates, and regarded as trustworthy. Some of them are old timers. The camp is essentially a war time camp. Two barracks buildings, one to serve as a mess hall and the other as sleeping quarters, are in use now, and a third, to provide another dormitory, is under construction. Barns have been built and a bathhouse and cold storage plant will follow. The state does not intend to place the men under the contractor and then leave them here. Baseball equipment is to be sent to the camp and teams organized. Magazines and newspapers will be provided. The men will not work Sundays and chaplains of the penitentiary and reformatory will come to conduct open air chapel exercises. The contractor pays the state highway department $1.50 a day for each man. The state furnishes all subsistence, the supplies coming from the central warehouse of the penitentiary. The state also supervises the men. Three guards came from the penitentiaries with those now at work, and three will come from Mansfield. The men get five cents an hour, the sum they would receive for work within their institutions. C. T. Evans is chief officer of subsistence and heads the guards. A. T. Schooley of Westville, former night guard at the penitentiary, is guard captain at the quarry. The men wear no distinguishing mark that would show them to be convicts. They mess together now at the camp, but later a truck will deliver their meals to them along the road.

$7,000,000 More for New York Roads.

Albany, N. Y.—Governor Whitman has finally signed the Sage bill which will give the state $7,185,680.82 additional to spend for the construction and improvement of public highways under the direction of Edwin Duffey, state commissioner of highways. This amount is really the unexpended balance of the appropriation of 1916. The governor has also signed the bill appropriating $2,090,000 for state aid for township highways, roads on Indian reservations and roads in Franklin county.

SEWERAGE AND SANITATION

Big Flood Prevention Work Halted by Court.

Erie, Pa.—Pending a possible state supreme court decision, no further work is to be done on the million dollar Mill creek flood prevention project. An opinion by judge U. P. Rossiter held that no contract existed between the city and the defunct Metz and Roth company, contractors, due to the refusal of C. L. Baker, former superintendent of city finances, o countersign the agreement. For the same reason, the opinion held, there was no contract with George Cantrell, Inc., of Philadelphia, who succeeded Metz and Roth on a "cost plus" basis to complete the work when the latter company went bankrupt and quit work. Judge Rossiter's opinion reviewed the project from the spring of 1916 when a bond issue of $950,000 was authorized at the polls for the improvement of Mill creek, to prevent the repetition of the flood of the preceding August. The opinion was in answer to a bill in equity brought by T. A. Lamb, attorney, to prevent continuation of the Mill creek work under a continuation contract with Cantrell, after Metz and Roth quit. As a result of the bill, council was restrained from going ahead with the project pending a court order. When C. L. Baker, as finance superintendent, refused to countersign the Metz and Roth contract, he gave as his reason the argument that the contract was illegal because the actual money was not on hand in the form of a specific appropriation. The decision says in part:

> "In the case at bar there was admittedly no attempt whatever to certify. It is certainly the fact, and it is conceded by all parties to this suit, that there was no certification by the superintendent of finance. It does not certify that the controller had charged the amount of the expenditure for this improvement against the appropriation (even if there was an appropriation, which is disputed) which was made for its payment. There was no certification made at all, and the statutory consequences of such omission is that the contract between the city of Erie and the Metz and Roth Company, Inc., cannot 'take effect as a contract.'
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> "This is not a case where part of the funds were to be raised by the assessment of benefits. It was all to be raised from the assessment of benefits. It could not avail, for neither that nor any other certificate appears on either of the contracts.
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> "The infirmities of human nature, the natural disposition to favor friends, personal and political, and the various motives which influence public officers to depart from a strict and rigid adherance to the obligations that rest upon them as representing the public, make it important that they should be held strictly within the limits of the powers conferred upon them."
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> The court then asks the question: What effect does the fact that the Metz and Roth company contract does not take effect as a contract, have on contract?
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> "The question realy is, Of what force is a contract that is let to complete a contract that cannot take effect as a contract. The inquiry answers itself. If the original contract cannot take effect as a contract, then it cannot be either commenced or completed. Hence, as the Metz and Roth Company, Inc., contract cannot take effect as a contract, it cannot be completed as a contract, for it never could commence as such.
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> "The contention of the city, however, is that the Cantrell contract does not depend on the Metz and Roth contract for its efficacy; that it is not auxiliary thereto, or in any way connected therewith, derives no start or impetus therefrom, but stands as an independent undertaking. In this we do not agree for the reasons that after the withdrawal of the Metz and Roth Company, Inc., the idea, as gathered from the subsequent proceeding, seems to have been that under Section 91 of that contract, the city had the right 'to proceed to complete the work at the sole charge and expense of the city and recover damages from the contractor for the breach of the contract,' and that 'they had the right to take possession of the work and the entire plant of the conractor,' and in accordance with this idea the resolution authorizing the city engineer to advertise for proposals 'for the purpose of completing the Mill creek improvement in accordance with the Metz and Roth contract,' was followed by the resolution, authorizing 'the mayor and engineer' to employ Cantrell to complete the Metz and Roth contract.'
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> "But supposing, for the sake of the discussion, that the Cantrell contract was intended as an independent contract, and not as auxiliary, continuing or completing the Metz and Roth contract, what then do we find? We find that it was a contract involving the appropriation of money; that there was no independent designated item of appropriation on which it was founded; no estimated amount of estimate and a cost plus percentage expenditure thereunder, which is charged against an independent designated item of appropriation, unless the profit is an estimate (which we do not decide), and no certification on the contract by the superintendent of finance that such appropriation and estimated amount of expenditure has been charged against that designated item of appropriation; all of which are conditions precedent to the legal efficacy of the contract, and the absence of any one of which is fatal to it as a contract.
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> "It is therefore apparent that the George E. Cantrell contract cannot stand either as a contract completing the Metz and Roth contract or as an independent self-supporting contract itself, but that considered either way it is inefficient and must fall."

U. S. Public Health Service Testing Vaccines.

Washington, D. C.—In order that there may be no doubt of the effectiveness of the serums and vaccines most in use both in the military forces and in civil life, the United States Public Health Service is now making tests of samples from every lot of these products made by the various manufacturers. The tests are made at the hygienic laboratory in this city before the products are placed on the market for sale in interstate traffic. The seriousness and prevalence of pneumonia and meningitis at the present time make it of the greatest importance that the reliability of any individual dose of the serums be guaranteed. As rapidly as possible the Public Health Service has been determining upon standards for the different serums and vaccines used in preventing disease, and where sufficiently accurate standards could be found it has held the manufacturers up to them. Tests for reliability are now made in the case of serums and vaccines used in pneumonia, meningitis, smallpox, typhoid fever, diphtheria, and tetanus. Since 1902 the Public Health Service has had supervision by law over the manufacture of viruses, serums, and toxins to be sold in interstate traffic. At the present time a large number of firms are licensed for the manufacture of these products. This means that their establishments are satisfactory from a sanitary point of view and that their products are free from contamination. In the case of the serums used in the six diseases mentioned it means, moreover, that the products, as made, have been found capable of preventing the diseases they are to be used against.

Tracing of Typhoid Carrier Halts Epidemic.

Superior, Wis.—What threatened to be a serious epidemic of typhoid fever in this city has just been successfully averted. Nine cases of the malady broke out on one milk route, but it was successfully checked by Dr. D. R. Searle, city health commissioner; William Strasser, city bacteriologist, and Emil Haeske, milk inspector. This fight against typhoid is one of the most interesting in the city's history. Two previous outbreaks of the disease had occurred on the same milk route, but the cause of the trouble has been removed at last. A dairyman's wife and son have been discovered to have carried the disease for 16 years. Health commissioner Searle gave it as his opinion that if the epidemic had not been stopped when it was, it might easily have affected hundreds of persons. When a cousin of one of the dairy farmers who supplies Superior's retail milk demand came over from Duluth sixteen years ago to recuperate from an illness with typhoid fever, this was the first link in the chain of infection, according to the authorities. Next the dairyman's wife became ill with the disease, also one of his sons. Both recovered completely. However, health department officials have found that the woman had been a carrier of typhoid for sixteen years and both herself and her son have been carriers of para-typhoid for that length of time. One case broke out on the milk route more than a month ago, but it was not reported immediately by the physician in charge. Then two more cases broke out and the health department began to investigate. The milk supply was immediately subjected to pasteurization. Blood and other tests were made on all members of the family and the premises were cleaned up on the dairy farm. Those who were found to be carriers of the disease were isolated.

Health Officials Cooperate on Food Conservation.

Washington, D. C.—State health officers of the country will actively cooperate with the federal food administrators of the various states. This is a result of an offer by the American Public Health Association to have its members assist in carrying on the work of food conservation in the states. The administrators have been requested to communicate with the health officers of their respective states and decide upon a method of utilizing the newly acquired and valuable assistance. Each state has a health department, the head of which is a member of the American Public Health Association. In each of the 3,100 odd counties there is a county health officer, and in many states township health officers as well. There are some 235 cities, each with a health officer in touch with the state health department. Altogether there are approximately 40,000 people employed in some capacity by these various health agencies. There are also about 150,000 physicians closely connected with the local health officials, and the public health association has assured the food administration that most of the physicians would be able to serve the cause of food administration in some capacity.

WATER SUPPLY

To Make Plant Self-Sustaining with Higher Rates.

Yonkers, N. Y.—Following approval given by the common council to the proposed ordinance imposing a frontage tax of 5 cents a foot on all property along streets where water mains are laid, public works commissioner See prepared a new scale of water rates, which became effective on April 1st. Henceforth the water used for factories and mechanical purposes will be sold by the city at the flat rate of 10 cents per hundred cubic feet. At present the price to the manufacturing consumer has ranged from 8 cents to 13 cents, the average price being 9 cents a hundred cubic feet. The new schedule provides that water used for any and all other purposes will be sold at the rate of 16 cents, an increase of one cent on the hundred feet. In addition to this the minimum rate for all dwellings, stores, shops, hotels, factories, livery stables, wharves, barns and other buildings, establishments and trades, yards and other premises having connection with the city water mains will be $2 per quarter instead of $1, as heretofore. When mayor Wallin presented the bill for the frontage tax to the board of aldermen he announced that if the proposition was not put into effect it would be necessary to increase the price of water to the household consumer to 22 cents in order to put the water bureau on a self-sustaining basis. If the frontage tax is approved by the legislature he hopes, with the one-cent increase in price just announced, to bring the revenue up to the point where the old deficiencies of the water bureau can be wiped out and the department run in future without a loss.

$1,250,000 Water Works Bond Issue Approved.

Kansas City, Mo.—The voters at the recent special election decided in favor of the proposal to issue bonds in the sum of $1,250,000 for the purpose of constructing a new waterworks pumping station and a gravity flow conduit 22,000 feet long, by a vote of 33,583 to 2,858. More money will be added to the amount of the issue from the funds of the water department. Work will be done under the chief engineer of the department, Burton Lowther.

Out-of-City Consumers to Pay More for Water.

Ontario, Cal.—Consumers of water from the municipal system residing outside the city limits will pay 50 per cent more for their water than those residing within in the future, as the result of action taken by the city council. Heretofore inside and outside users have been paying the same rate, but in considering the matter the board took the stand that outside consumers are really getting their water for less than those inside, since the former pay no city taxes for the upkeep of the system. The present rates are $1 minimum for the first 1,000 feet and 50 cents a 1,000 for all excess. The new outside rate will be $1.50 and 75 cents.

STREET LIGHTING AND POWER

Commission Order Stops Free Extensions.

Springfield, Ill.—The Commonwealth Edison Company and the Public Service Company of northern Illinois filed with the state public utilities commission last November a petition for the suspension during the period of the war of the utilities rule which provides for free extension to prospective customers, provided that the line extension does not require more than twice as many poles at standard spacing as there are individual applicants. It also provides for charging for extensions above the free limits. The petition was contested by attorneys for several real estate boards in the territories of the petitioning utilities. In its decision the commission modifies the rule as follows:

> That present conditions warrant a modification of the rules of the commission governing the making of extensions for serving new business, and that by the modified rules the petitioners may require a deposit from customers who desire an extension of the petition in the amount of the cost of such construction, but that such a cost used as the basis for deposit would not include any amount for distribution transformers, for service connections of ordinary lengths extending from the pole lines or underground conduits to consumers' premises, or for consumers' meters, and that service should be rendered to any consumer complying with these deposit conditions unless an individual case is of such character that it appears that the revenue anticipated from the extension will not provide at the expiration of five years an adequate return upon its cost.
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> The commission further finds that in the case of extensions made for power service repayment of the deposits collected should be instituted immediately upon the cessation of the war, and that the amount of such monthly repayments should not be less than 25 per cent of the net bill for service, and that in the case of extensions made for lighting service repayment of the deposits collected should be made monthly at a rate of 25 per cent of the monthly bills, and that such repayment should be instituted with the first bills for service rendered.
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> The commission further finds that interest should be paid at the rate of 5 per cent per annum upon that portion of the deposit held by the petitioners which exceeds the cost of a free extension as defined by the original Rule 31 until such a time as the repayment shall have amounted to the cost of such free extension, and that interest at the rate of 5 per cent per annum should be paid upon the entire deposit until such time as repayments are instituted in accordance with the conditions herein set forth In securing interest due in order to avoid the complication of interest computations on various amounts, such interest after repayments have been started may be computed over the entire period for which it is to be paid upon one-half of the gross amount of the excess deposit.
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> In their petition the applicants appear to be governed by patriotic motives to an extent fully as great as by any pecuniary advantage which might result from deferring extension until a more advantageous time. From the standpoint of personal interest, the extension of utility service involves the payment of larger sums of money for lines and station capacity and other necessary improvements than would be necessary for the development of the systems under normal conditions. From a patriotic standpoint it involves the employment of material and labor, of which the country faces a scarcity, and the utilization of capital which may be necessary for governmental needs in the prosecution of the war.

City Protests Against Gas Rate Ruling.

Newark, N. J.—Argument was heard by the state public utility commission at Trenton upon an application of Newark for a reopening of the cases in which the commission recently granted permission to the Public Service Gas Company and the Public Service Electric Company to increase their rates. Jerome T. Congleton, who appeared for Newark, took exception to the decision of the board under which the rate increase was made applicable to the February bills, which included gas and electricity consumed during the last few days of January. Mr. Congleton contended that the board had exceeded its powers in attempting to make the rates retroactive and no order of the board should become effective until the expiration of twenty days from the date of issuance. Ralph W. E. Donges, president of the board, suggested that Mr. Congleton had misapprehended the actual condition and remarked that, in permitting the increase, the board had filed no order, but had merely permitted a tariff of rates submitted by the companies to become effective. Mr. Donges said the question involved at the hearings was not whether the proposed rates were reasonable, but whether the board should exercise its power to suspend them, pending an investigation and determination of their reasonableness. Having decided that the prima facie case did not warrant a suspension of the rates, even though the increase suggested had been modified by the board, Mr. Donges said it required no action further than a decision not to order suspension to make the rates effective.

Preference List for Fuel Priority.

Washington, D. C.—The War Industries Board of the Council of National Defense has authorized the following statement: The Priorities Board has adopted Preference List No. 1 for the guidance of all governmental agencies in the supply and in the distribution by rail or water of coal and coke. While the list speaks for itself, it is proper to say that the board has not undertaken to classify any industry as nonessential or at this time to limit the quantity of fuel which any particular industry or plant shall receive. The board has, however, listed certain industries whose operation is of exceptional importance, measured by the extent of their direct or indirect contribution either toward winning the war or toward promoting the national welfare, and these industries will be accorded preferential treatment by the Fuel Administration in the distribution of coal and coke, and also in the transportation of such coal and coke by the railroads. This same plan will be followed in according preferential treatment to war industries and plants in the transportation of raw materials and supplies required by them in their manufacturing operations, so that they may not be delayed or hampered in complying with priority orders issued against them governing their products. Preference List No. 1 is not complete in itself, but it will be noted that provision is made for certifying additional classes of industries, and also individual plants whose operations are necessary as a war measure. In determining what industries or plants are entitled to be certified, two factors will control: (1) The relative urgency of the uses or purposes for which the product of the plant is utilized; and (2) the per cent of the product of the plant utilized in war work, direct or indirect, or work of exceptional or national importance.

No plant, a very substantial per cent of whose product is not of exceptional importance, can be accorded preferential treatment. The priorities commissioner shall, under the direction of and with the approval of the Priorities Board, certify additional classes of industries, and also certify individual plants whose operation as a war measure is of exceptional importance, which industries and plants when so certified shall be automatically included in this Preference List, which shall be amended or revised from time to time by action of the Priorities Board to meet changing conditions.

No distinction is made between any of the industries or plants which are or may be included in this Preference List, and no significance should attach to the order in which the industries or plants appear in the list: Aircraft, plants engaged exclusively in manufacturing aircraft or supplies and equipment therefor; ammunition, plants engaged in the manufacture of ammunition for the United States Government and the allies; Army and Navy cantonments and camps—arms (small), plants engaged in manufacturing small arms for the United States Government and for the allies; chemicals, plants engaged exclusively in manufacturing chemicals; coke plants; domestic consumers; electrical equipment, plants manufacturing same; electrodes, plants producing electrodes; explosives, plants manufacturing explosives; farm implements, manufacturers exclusively of agricultural implements and farm-operating equipment; food and food plants—feed, plants producing feed; ferroalloys, plants producing; fertilizers, manufacturers of fertilizers; fire brick, plants producing exclusively; food, plants manufacturing, milling, preparing, refining, preserving, and wholesaling food for human consumption; food containers, manufacturers of tin and glass containers and manufacturers exclusively of other food containers; gas, gas-producing plants; gas, plants manufacturing exclusively gas-producing machinery; guns (large), plants manufacturing same; hemp, jute, and cotton bags, plants manufacturing exclusively hemp, jute, and cotton bags; insecticides, manufacturers exclusively of insecticides and fungicides; iron and steel, blast furnaces and foundries; laundries; machine tools, plants manufacturing machine tools; mines; plants engaged exclusively in manufacturing mining tools and equipment; newspapers and periodicals, plants printing and publishing exclusively newspapers and periodicals; oil, refineries of both mineral and vegetable oils; oil production, plants manufacturing exclusively oil-well equipment; public institutions and buildings; public utilities; railways; railways, plants manufacturing locomotives, freight cars, and rails, and other plants engaged exclusively in manufacture of railway supplies, refrigeration, refrigeration for food and exclusive ice-producing plants; seeds, producers or wholesalers of seeds (except flower seeds); ships (bunker coal), not including pleasure craft; ships, plants engaged exclusively in building ships (not including pleasure craft) or in manufacturing exclusively supplies and equipment therefor; soap, manufacturers of soap; steel, steel plants and rolling mills; tanners, tanning plants, save for patent leather; tanning extracts, plants manufacturing tanning extracts; tin plate, manufacturers of tin plate; twine (binder) and rope, plants producing exclusively twine and rope; wire rope and rope wire, manufacturers of same.

FIRE AND POLICE

Big Blaze in Machinery Plant.

Pawtucket, R. I.—Fire of suspicious origin consumed several hundred thousand feet of lumber and did damage estimated at more than $150,000 at the plant of the Narragansett Machine Company. The establishment is engaged on orders for the government, making machinery for munitions plants and winches. The blaze practically destroyed the concern's large stock of lumber in addition to burning out departments used in the manufacture of gymnasium apparatus. The main plant, containing the machine shop, was not damaged by the fire except the damage done by water leaking from hose stretched through the building. With a strong breeze fanning the flames the firemen had hard work to keep the fire from spreading to the main buildings of the plant. According to chief Fuller some of the damage could have been averted if there were more hydrants in the yard of the plant. When the fire was hottest a careful watch was kept over two tanks containing naphtha and enamel, which were in danger of being ignited. The fire started in a corner of an old locker shed and several minutes after the alarm was sounded worked its way between the partitions to the enamel room. Before the firemen arrived upon the scene the blaze followed the walls and worked nearly the entire length of the enamel room, which is more than 400 feet long. The old locker building was a mass of flames and the blaze jumped the spur trackage and ignited the large lumber sheds. Chief Fuller saw that the blaze was rapidly gaining headway and immediately upon the arrival of the apparatus hose was laid from every available hydrant. Ten streams were throwing water into the flames twenty minutes after the alarm was sounded. A general alarm was pulled by chief Fuller and the firemen from Central Falls moved into the fire headquarters to assist the Pawtucket firemen. Twice during the evening chief Fuller sent the auto wagon back to headquarters to bring more hose to the scene of the fire. The firemen were handicapped by the necessity for laying long lines of hose before the flames could be reached. The shortest line was carried more than 700 feet before it could be used. The men fought the blaze in the enamel shop and confined the burning to one-half of the structure. The centre building of the lumber sheds caught fire and the intense heat prevented the firemen from fighting the flames at close range. Chief Fuller withdrew several lines of hose from each side of the enamel building and began the fight to try and save the lumber sheds where more than 3,000,000 feet of wood was stored. The firemen were rewarded with the saving of the large three-story lumber shed adjoining the machine shop and the small two-story shed.

Four Fire Departments but No Water.

St. Nazianz, Wis.—Fire starting from an explosion of a gasoline tank in a garage in this village, ten miles east of Kiel, swept the business block of the village, destroying seven dwellings, the state bank building and a general store housing the telephone exchange. The fire raged all day, fanned by a brisk wind. It gained headway when a bucket brigade failed to cope with it and lack of water prevented fire departments from Kiel, Valders, New Holstein and Manitowoc, which came to aid, from checking the fire. Water was obtainable only from a small lake. St. Nazianz is the seat of a Catholic seminary, which, however, was not touched by the fire.

Firemen Try to Become Policemen for More Pay.

Richmond, Va.—Firemen who aspire to become policemen are jeopardizing their jobs with no prospect of winning the blue uniform and badge, according to several members of the fire department who recently resigned with the expectation of being appointed to higher salaried positions on the city's payrolls. The complainants say they learned only after relinquishing their places in the fire department that an "agreement" exists between the police and fire department officers that no ex-firemen shall be taken on the police force. They allege that this is an illegal restriction on their rights as citizens. It was explained to them, they assert, that an agreement of this kind was found necessary because a stampede from the fire department to the police force had begun. It was necessary to discourage firemen in order to keep the fire companies up to service strength. The attraction the police force holds for the firemen is higher pay, combined with shorter hours. The grade B fireman is paid $1,120.40 a year, the police patrolman $1,212.53. Except when he has his regular days off, the fireman is in service twenty-four hours a day. The policeman works eight hours. Secretary L. S. Jones, of the fire department, when asked if the board of fire commissioners had entered into the agrement with the chief of police or the mayor, denied the report. He said the board of fire commissioners had taken no action whatever on the matter. He was confident that the board members knew nothing of the agreement, individually or as a board.

Business and Residence Section Swept by Fire.

West Tampa, Fla.—Fire which originated in an abandoned cigar factory swept that part of West Tampa from Cleveland avenue to the business section, destroying over a hundred residences in addition to the city's most valuable business houses. The loss is estimated at least $250,000. No cigar factories were burned. The fire started about 3 o'clock in the afternoon, and was brought under control about five hours later. The first area swept clean by the flames constituted about five solid blocks of closely built houses. The flames then jumped to the alley between Green and Laurel streets, the number of houses burned in this section being about twenty. The residences were occupied by Latins, many of whom lost their entire home furnishings, and spent the night in the streets, bedded upon mattresses. The civilian relief committee of the Red Cross issued a call for clothing, money, food and other things which can be used for the relief of the unfortunate people. As the flames spread from the old cigar factory to the residences nearby the West Tampa fire department, unable to cope with the flames, was reinforced by units from the Tampa fire department, but the combined efforts of the two departments proved ineffective as the flames swept rapidly from one frame building to another, consuming them with great rapidity. One by one the buildings were burned and the firemen retreated, making a desperate stand when the business section of the city was reached. The gas company, electric light company and telephone company rushed crews to the scene to save telephones and gas meters. Current was cut off from the trolley wires and when the flames slowly died out West Tampa was in darkness. The few injuries reported as resulting from the fire is considered remarkable under the circumstances. Efforts on the part of the police to control the crowds which surged forward and hampered the work of the firemen were without avail, and as the flames spread and the business district was threatened fire chief W. M. Matthews requested Maj. D. F. Conoley to call out the home guards. Within thirty minutes fifty members of the armed guards in full uniform were on the grounds, and within an hour 150 men were on duty. The residence of mayor O'Halloran was one of those destroyed.

Lancaster Firemen Fight $200,000 Blaze.

Lancaster, Pa.—A $200,000 fire wiped out a large seed and implement establishment in the commercial district of the city. The fire raged for three hours fanned by a stiff east wind which made the conditions look bad for the adjoining buildings, but the fire was confined to the one building, which was three stories high, 30 feet wide and 240 feet long. The fire started in the middle of the building near the elevator shaft. As no fire was known to have been in the building and the main electric switch turned off, the only cause to which it is thought the fire might be ascribed, is a gas explosion. The water department men were called into service to help handle the twenty-two lines of hose to fight the fire as well as to help save other buildings. It just happened that a large number of soldiers were in the city to help boost the Liberty Loan and a majority of them were on the job and did good service. This fire gave the new electric driven centrifugal pumps a test as they were using at the rate of 5,000 gallons per minute and, according to a communication from secretary John T. Brainard of the water department, two pumps held the pressure for the entire city at 108 pounds. Fortunately for Lancaster the fire department did excellent work under its efficient head, chief William Johnson, and his brigade were fully equal to the occasion. Lancaster has five companies and two truck companies, all motorized except one. This one will be equipped in the near future.

Retirement Denied to Police Chief.

Yonkers, N. Y.—Police chief Daniel Wolff, who applied recently to be placed upon the retirement list, has been found physically fit to continue his duties as head of the police bureau. The committee of local doctors appointed by public safety commissioner Mitchell to examine into the chief's claim that he was not able to continue because of illness, submitted the following report: "We find that chief Wolff is suffering from a double hernia and a mild form of diabetes; that his physical strength is but slightly impaired; that he is physically able to do a limited amount of work; that we find him in his present condition able to work for the force of which he is a member." Commissioner Mitchell, upon receipt of the report, asked Dr. A. C. Benedict, the chairman, for further particulars regarding the physical examination that had been made. He asked whether the condition of the chief could be cured by operation or by form of treatment. He also requested Dr. Benedict, who is surgeon of the police bureau, to submit to him a report on the chiefs' condition during the ten years that the latter has been in the department. The chief in his application claimed a pension under the disability clause in the law. He receives a salary of $3,300 a year; if retired would have drawn $1,650 from the city annually for the remainder of his life.

GOVERNMENT AND FINANCE

Would Vote Again on Manager Plan.

Sioux Falls, S. D.—A petition bearing 710 names of voters of the city has been filed with the city auditor asking the city commissioners to call an election to submit to the voters of the city the proposition of putting Sioux Falls under the city manager form of government. The petition, it is claimed, bears 65 more names than is required by the law, and those who are behind the city manager plan hope that the city commissioners will call the election. Sioux Falls recently voted in favor of the city manager plan, but the law was attacked and declared unconstitutional by judge J. W. Jones. Then at the special session of the legislature two bills were rushed through to correct defects in the original bill and it is under these laws that the petitioners seek to have another election called.

Not Authorized to Pay Councilmen.

Charleston, W. Va.—Members of council in towns and villages incorporated under the general law cannot receive compensation for their services, no provision having been made for such compensation under the general law and the acts of the legislature of 1915 providing that it shall be unlawful for the council of any municipal corporation "to expend any money or to incur any obligation of indebtedness which such tribunal is not expressly authorized by law to expend or to incur." State tax commissioner Walter S. Hallanan has so ruled in construing the statues with regard to the duties and compensation of council members, and the recorders of West Virginia towns incorporated under general law were notified of the ruling. "In making audits of municipalities we find that in a number it has been the practice for the town or village council to receive compensation for their services," says commissioner Hallanan's letter to the recorders. "We have made an examination of the statutes and are unable to find any law authorizing members of council to receive compensation for their services in towns or villages incorporated by authority of the circuit court."

STREET CLEANING AND REFUSE DISPOSAL

Laborers Strike—Streets Unswept.

Baltimore, Md.—Rejecting the plea and proposals of mayor Preston, to return to work, the city laborers' union formally voted to strike at once to enforce a demand for $3 a day for laborers in all departments. The city offered $2.76. About two thousand men went out. Mayor Preston told the men the city would recognize the union, but he declined all propositions laid before him for the wage increase demanded. The streets remained unswept.

Federal Investigation Finds Food Waste in Garbage.

New York, N. Y.—The results of the federal food board's efforts to ascertain, through inspection of garbage cans, how much food is thrown away in the average household, were recently made public for the first time in the report of Miss Margaret Butler. Miss Butler included in her survey all of the main apartment house districts of the city. On the whole she found the garbage output had decreased to about half of what it was in pre-war times, although, she said, in districts here and there "enemy alien servants" were apparently doing all in their power to increase rather than decrease the amount of waste. Her investigation lasted five weeks. She found many instances where large quantities of broads and meats had been thrown into garbage pails that might have been used for human food. Porters gathered bread in many places, according to her observations, and sold it for chicken feed. In some places the pieces of bread were so small as to indicate that there had not been any willful waste or deliberate disregard of the appeals of the food administration. Waste of meatstuffs was found to be general in some places and in others there was a greater waste of poultry, such as chicken and turkey. Lamb chops and bacon which should have been eaten were also found in the garbage in great amounts.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

County Bridges—Commissioners.

Arkansas.—Acts 1915, p. 1346, authorizing organization of assessment districts for raising money to aid county to build bridges, is not objectionable because it authorizes appointment of one set of commissioners by county and another by city council.—Mullins v. City of Little Rock, 198 S. W. 262.

Maintenance of Bridge—Weight of Vehicle.

North Carolina.—Correct measure of duty of defendant town was maintenance of bridge of sufficient strength to bear up weight of any vehicle that could reasonably be expected in vicinity where it was placed.—T. J. Carter & Co. v. Town of Leaksville, 94 S. E. 6.

Regulation of Automobile Speed.

Wisconsin.—St. 1915, § 1323, relating to riding or driving over bridge faster than a walk, is not applicable to automobiles, and does not give a city power to regulate their speed.—City of Baraboo v. Dwyer, 165 N. W. 297.

Bridge Defect—Frightened Horse.

Georgia App.—Where horse became frightened apart from any defect in county bridge, and bystander intercepted it on bridge, causing it to wheel, and fall from bridge, which had no guard rails, county was not liable, as proximate cause was nature of horse and efforts of bystander.—Corley v. Cobb County, 93 S. E. 1015.

Property for Public Use—Prior Use.

Minnesota.—Rule that property already devoted to public use cannot be taken for another public use without express authority therefor does not apply to property of a cemetery association not actually put to prior use and not shown to be presently needed therefor.—In re Board of Water Com'rs of St. Paul, 165 N. W. 279.

Limitation of Courts—City Appropriating Private Property.

Kansas.—The court cannot sit in judgment upon the motives actuating municipal authorities in appropriating private property for public use.—De Priest v. Camp, 168 P. 872.

Laying Out Street—Compensation.

North Carolina.—Abutting owner is not entitled to compensation for laying out street which is absolute necessity for use of his own lot.—Turner v. North Carolina Public Service Co., 93 S. E. 998.

Public Alley—Acceptance by City.

Illinois.—Where alley had been publicly used 25 years, and there had been void attempt by city to vacate it, inference of acceptance by city was justified.—Rollo v. Pool, 117 N. E. 756.

Street Dedication—Right of Use Lost.

Washington.—As strip of land claimed to be dedicated as street by platting was never within corporate limits of city, right of use as public highway was lost upon expiration of 5 years without opening, following filing of plat, in view of Laws 1890, p. 603.—Tamblin v. Crowley, 168 P. 982.

Live Wire—Negligence.

Missouri App.—Persons have a right to travel on streets even to satisfy curiosity and are not negligent unless it appears positively that they voluntarily and knowingly came in contact with a live wire, or had such knowledge as would put an ordinarily prudent person on inquiry.—Faris v. Lawrence County Water, Light & Cold Storage Co., 198 S. W. 449.

Right of Way—Adverse Use.

Maine.—Twenty years' adverse use is necessary to gain the right to use a private right of way.—Wooster v. Fiske, 102 A. 231.

Drainage Districts—Corporate Nature.

(Idaho) Drainage districts are "quasi corporations," being public in their nature and designed to accomplish purposes conducive to the general welfare.—Burt v. Farmers' Co-op. Irr. Co., 168 P. 1078.

Drainage Projects—Details—Engineer's Recommendations.

(Iowa) Details regarding provision for small streams flowing into river proposed to be ditched, and cost thereof, are matters to be worked out in permanent survey of drainage district and improvement.—Hall v. Polk, 165 N. W. 119.

Without report and plat of engineer, found by board of supervisors to be disinterested and competent, drainage district may not be estabilshed, nor improvement ordered; nor can drainage improvement be constructed otherwise than as recommended by engineer.—Id.

Drainage district will not be established to dig ditch to carry off excess surface and river waters, plan being to make ditch undersize, relying on its being enlarged by natural action of water; in absence of showing enlargement is likely to happen within reasonable time.—Id.

Drainage Projects—Compensation of Employees.

(Ind.) Under Acts 1885, c. 40, §11, and Acts 1903, c. 232, §1, bond given by petitioners for establishment of drain held for the benefit of the drainage commissioners, rodman, axman, etc.—State v. Kaukman, 117 N. E. 643.

Acts 1885, c. 40, §11, does not make county liable for compensation of drainage commissioners and chainmen, rodmen and axmen where proceeding is dismissed and drain never established.—Id.

Drainage Improvements—Overflow Damages—Contractors' Negligence.

(Ark.) Contractors constructing drain are liable for injuries for negligent acts done independently for their own private convenience, but not for damages from overflow caused by dam built, according to contract, with skill ordinarily possessed and exercised by contractors doing same or similar work.—Mitchell v. Hahn, 198 S. W. 528.

(Ark.) Although contractors are constructing drain under supervision of district engineer they are nevertheless liable for overflow caused by negligence and unskillfulness in building dam.—Mitchell v. Hahn, 198 S. W. 528.

Instruction that to find for plaintiff damage must be caused by dam and that damage must have been of such nature that ordinary person could have foreseen and prevented it is not open to objection that it prevents inquiry as to faulty construction in failing to provide adequate spillway.—Id.

Flood Prevention District — Constitutionality — Taxation.

(U. S. D. C.) If Ohio Conservancy Act, §12, denies to counties and cities right to object to plan of improvement, held that taxpayer of city and county will suffer no irreparable injury, and may not enjoin the improvement.—Orr v. Allen, 245 F. 486.

(U. S. D. C.) Assessments under the Ohio Conservancy Act held made for a public use.—Orr v. Allen, 245 F. 486.

Ohio Conservancy Act, §34, providing that appeal from award of compensation or damages or benefits shall be from the award, and from no other part of the decree, held not invalid.—Id.

Ohio Conservancy Act, §43, provided for tax on assessed valuation of conservancy district to pay preliminary expenses, held a proper exercise of the power of taxation.—Id.

Ohio Conservancy Act, §§46, 47, as to assessment for maintenance of improvement and additional levies to pay principal and interest of bonds, held valid.—Id.

(U.S.D.C.) The Ohio Conservatory Act, authorizing the establishment of conservancy districts to prevent floods, etc., is constitutional.—Orr .. Allen, 245 F. 486.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

April 23-24.—LEVEE AND DRAINAGE CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Conference, St. Louis, Mo. Secretary-treasurer, C. S. Gannon, 421 National Bank of Commerce Bldg., St. Louis, Mo.

April 23-26.—SOUTHWESTERN WATER WORKS ASSOCIATION. Seventh annual convention, Tulsa, Okla. Secretary-treasurer, E. L. Fulkerson, Waco, Tex.

April 26, 27.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, University of Pennsylvania, Philadelphia.

May 7-9.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 7-10.—CANADIAN GOOD ROADS ASSOCIATION. Annual road congress. Secretary, George A. McNamee, 909 New Birks Bldg., Montreal, Que.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 14.—AMERICAN ASSOCIATION OF ENGINEERS. Fourth annual convention, Chicago, Ill. Secretary, A. H. Krom, 29 South LaSalle St., Chicago.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Goss, 315 Plymouth Court, Chicago, Ill.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, Roanoke, Va.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

National Electric Light Association.

At a recent meeting of the executive committee of the National Electric Light Association it was decided that a committee of three members should be appointed to co-operate with similar committees of the electric railway and gas industries in the formation of a conference or joint committee to advise in regard to such utility problems of national interest as may be specifically assigned for consideration. This follows consideration of a plan to give specific direction and authority to the work which is being done now by the National Committee on Public Utility Conditions, representing the N. E. L. A., American Electric Railway Association, American Gas Institute and National Commercial Gas Association.

President J. W. Lieb reported at the meeting that the association, in the referendum of the Chamber of Commerce of the United States on water-power development, has given its affirmative vote for the proposed legislation by Congress. The committee approved the action.

Twenty-seven additional central stations have been admitted as members, also 773 Class B members, 13 Class D members, 76 Class E members and 3 foreign members.

The convention committee of the National Electric Light Association has decided to hold the annual meeting, devoted entirely to war problems, at Atlantic City on June 13 and 14, with the Hotel Traymore as headquarters.

The joint convention of the Pacific Coast Section, N. E. L. A., California Association Electric Contractors and Dealers, and the National Electrical Supply Jobbers' Association of the Pacific Coast will be held at Del Monte, Cal., May 9-11, 1918. This convention had been planned for April 24-27, but was postponed to avoid interference with the Liberty Loan campaign.

Idaho Firemen's Association.

The Idaho Firemen's Association held its recent convention in Pocatello in the council chamber at the city hall. R. W. Burroughs of Jerome is president of the association.

Chief A. B. Canfield of the Pocatello fire department gave a very interesting paper on "Friendship and Co-operation Between Paid and Volunteer Firemen."

Secretary L. B. Redford of Rupert read a paper on "The Benefits to Be Derived From State Organizations."

Warren Compton, assistant chief of the Boise fire department, spoke on "Fire Protection for Schools and Children."

A paper on "The Troubles of a Volunteer Fire Chief" was read by Harry Levy of Gooding and was followed by a paper on "Fire Prevention by Legislation as Well as by Education," by John D. Nimes of Jerome.

A banquet and dance were features of the convention.

Wisconsin Electrical Association.

The convention of the Wisconsin Electrical Association at Milwaukee was held March 27 and 28, and the program included papers dealing generally with rates and rate increases. On the second day all papers except that of M. C. Ewing of Wausau dealt with operating problems.

Daniel W. Mead, consulting engineer, of Madison, discussed "Increasing the Output of Hydroelectric Plants," and divided means into those of "Saving Head" and "Saving Water." Under the former he discussed losses that occur in the headrace due to velocities above 3 feet per second in low-head plants, to racks without specially designed bars, to improperly designed tailraces and to leakages through dams. From the latter cause enough water has been known to escape to cause a loss of $75,000 a year. He criticised severely the policy of many waterwheel manufacturers who have been in the habit of selling wheels which are considerably underrated.

L. M. Burch, president of the Elec-

(*Continued on page 340*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Lorain, O., is improving its WATERWORKS. The consulting engineer associated with city engineer C. C. Miller is Morris Knowles.

Ardmore, Ill., is to make STREET IMPROVEMENTS amounting to about $25,000. The engineer for the work is E. L. Hancock.

A SEWAGE DISPOSAL PLANT to cost $20,000 is to be built by Rocky River, O. The consulting engineer for the improvement is R. Winthrop Pratt.

A FILTRATION PLANT is to be built by Weston, Ont., from plans drawn by the firm of James, Loudon and Herzberg.

A reinforced concrete BRIDGE is to be built by Lawrence, Mass. Plans and specifications for the structure have been completed by the consulting engineer, B. H. Davis.

Jackson, Ingham, Washtenaw and Hillsdale counties have formed a district to make extensive DRAINAGE IMPROVEMENTS. The engineers for the work are the firm of Zimmer & Zickgraf.

Wolsey, S. D., is to construct WATERWORKS. The engineer for the improvement is W. L. Bruce.

Holderness, N. H., has been considering the construction of a BRIDGE. The selectmen had the consulting services of the Storrs Engineering Co.

A FILTRATION PLANT and DAM are to be built by the village of Coxsackie, N. Y. The engineer for the improvements is Morrell Vrooman.

Redondo Beach, Cal., is to construct a BREAKWATER. The city has retained the consulting engineering firm of Koebig & Koebig to prepare plans for the project.

A SEWAGE DISPOSAL PLANT is contemplated by Mexico, Mo. The consulting engineering firm of Black & Veatch has prepared plans and specifications for the work.

Hamilton, O., is considering the improvement of its WATERWORKS by the installation of new machinery and extension of distribution system. J. W. Moore, consulting engineer, has submitted a report on the proposals.

INDUSTRIAL NEWS

Cast-Iron Pipe.—A meeting of cast-iron pipe manufacturers was recently held, at which the price situation was thoroughly discussed. While there was a feeling that higher prices ought to be named by the government, it does not seem probable that such action will be taken. The expectation now is that the present schedule will prevail until July 1. The demand from the government for extensions of lines at cantonments continues. Government prices remain constant. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A, $1 extra.

The Tiffin Wagon Company, Tiffin, O., has recently issued a new catalog of its street flushing equipment. The different types and sizes of the flushing and sprinkling machines are described in detail with complete specifications. Each kind is shown in illustrations. Machines in service in a number of cities are pictured. The book is excellently gotten up and should be of real interest to street-cleaning officials.

Universal Portland Cement Co., 210 South La Salle street, Chicago, Ill., announces the promotion of J. W. Lowell to the position of division engineer of the company at Pittsburgh, succeeding Mr. Talbot, who has accepted the commission of first lieutenant, Quartermaster's Corps, National Army. He is now stationed at Harrisburg, Pa., where he is engaged in work on the new Quartermaster's Depot.

Purchasing Agents Want Standard Size Catalogs.

A conference has been called by the catalog committee of the National Association of Purchasing Agents at which it is proposed to determine upon a standard size for catalogs. The conference will be held on May 22 at the Hotel La Salle, Chicago. W. L. Chandler, Dodge Sales & Engineering Co., Mishawaka, Ind., is chairman of the catalog committee. At the Pittsburgh convention of purchasing agents the size 8½ x 11 in. was tentatively adopted. The committee has had the matter up with 575 associations, representing various industries and trades, and 287 trade paper publishers. Quite a difference of opinion as to the best standard size is reported.

It is claimed that the size 7½x10⅝ in. is a logical one to produce from a sheet 32x44 in., running 16 pages. The size 8½x11 in. has already been adopted by the American Institute of Architects as its standard and that a great many manufacturers are issuing catalogs on the basis of that standard. Other associations, notably the gas interests, have been working on this same proposition and have adopted other standards. The desirability of having catalogs the same size of letterhead is also being considered. In this connection it is claimed that the size 8½x11 in. for a letterhead is not the most desirable size—that very few letters utilize the full sheet and that in the absence of the half size letterheads, which at one time were used, a great deal of paper is now wasted—that for somewhat the same reasons as apply to catalogs the size of letterheads should be 7½x10⅝ in. The catalog conference will be an open one.

The Brown Hoisting Machinery Co., Cleveland, O., has issued a new catalog, "E," describing its line of Brownhoist buckets and tubs. Among the equipment presented and illustrated are the excavating grab buckets, single rope grab buckets, contractors' grab buckets, drag line buckets and tubs. Specifications, tables of sizes and diagrams are included.

PERSONALS

Rudolph Blankenburg, ex-mayor of Philadelphia, died in his home there, April 12, after a short illness, in his seventy-sixth year.

For more than thirty years Rudolph Blankenburg was connected with reform politics in Philadelphia, and twenty-five years after he began his fight for decent government in that city he was elected mayor. His election in 1911 was the climax of one of the greatest reform campaigns ever fought in this country. At the end of a year he had overthrown the "contracting gangs," had driven out graft in the city departments, and had cleaned up the city government as far as was possible, with an antagonistic city council. He developed a thoroughly independent, highly trained, fully equipped police and fire-fighting force, thoroughly rearranged the taxation system, established a regular budget system for all departments, and placed them all on a business basis.

Rudolph Blankenburg was born in Germany in 1843. His father was the pastor of the chief church of the town. He had at first a private tutor, and then attended a gymnasium, where his studies were planned with a view to his entering the ministry. In 1865, at the close of the Civil War, young Blankenburg, then twenty-two years of age, came to this country, entered mercantile business as clerk, and after eleven years went into business for himself, retiring in 1909.

It was at the time of the Centennial Exposition in Philadelphia, in 1876, that Mr. Blankenburg began to be active in reform politics and civic improvements. He, with others, at this time detected a warning note in the wastefulness of charities in Philadelphia, and in 1877 the Society for Organizing Charities was formed.

Mr. Blankenburg, in the days of the famous Gas Trust, was a member of the Committee of One Hundred, which in 1881 was organized to deal with the corrupt measures of the political faction which was at that time making the city of Philadelphia a hotbed of graft.

In 1905 Mr. Blankenburg was importuned to take office for the first time, and was nominated by the City party as city commissioner. He was elected and for the next three years served in that office, returning to the city his salary of $5,000 a year. This he paid not to the city treasury, because he suspected the mismanagement of the city's finances, but to the Board of City Trusts, specifying that the income should be equally divided between the pension fund of the police, firemen and school teachers.

After his retirement from office he continued his civic interests. He was very active in the formation of the Town Meeting part last year, after the shooting scandals in the primary elections.

The following mayors have been elected in Maine:

Bath, Edward J. Drake.
Eastport, Fred T. Eldredge.
Hallowell, John M. Robinson.
Lewiston, Charles P. Lemaire.
Rockland, Frank C. Flint.
Saco, Edgar L. Minot.
South Portland, Charles E. West.
Waterville, Everett C. Wardwell.
Ellsworth, Alexander G. Hagerthy.
Bangor, John F. Woodman.
Belfast, Clement W. Westcott.
Biddeford, Hartley P. Banks.
Brewer, Charles W. Curtis.

NEWS OF THE SOCIETIES

(*Continued from page 339*)

trical Supply Company, Madison, discussed the aims and purposes of the new association of Wisconsin electrical contractors and dealers.

George E. Wagner, superintendent of plant for the Madison Gas & Electric Company of Madison, Wis., pointed out the advantages of three-phase, four-wire distribution as compared with the ordinary 2,300-volt delta-connected system.

M. C. Ewing, secretary-treasurer of the Wisconsin Valley Electric Company, Wausau, Wis., in a paper entitled the "Utilities and the War," emphasized the great need for rate increases and closer study of labor conditions.

"Metal Electrode Welding" was treated by Dean Treat, manager of the Wisconsin Railway, Light & Power Company, La Crosse, Wis.

Officers elected for the coming year were: President, John St. John, Madison; first vice-president, Raymond Smith, Oshkosh; second vice-president, W. C. Lounsberry, Superior; third vice-president, A. G. Babson, Watertown; secretary, J. P. Pulliam, Green Bay.

Municipal Journal

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GRADE CROSSING ELIMINATION AT PASSAIC

Obtaining Property—Avoiding Damage Claims—Grading with Heavy and Light Steam Shovels—Mixing and Delivering Concrete—Sewer Reconstruction—Cost of the Improvement.

By R. F. ODELL, Bureau of Engineering, Passaic, N. J.

Important grade crossing elimination work is now being carried out at Passaic, N. J. This city has a population of about 75,000 and is situated on the Boonton branch of the Delaware, Lackawanna and Western Railroad, about thirteen miles west of New York City.

The work in question was undertaken to do away with a dangerous condition caused by two main highways, which enter Passaic from the south and west, intersecting very nearly on the railroad right-of-way, which crosses the highways at grade at an angle of approximately 45 degrees, on a 3 degree curve.

Van Houten avenue, which bears a large amount of traffic, is 36 ft. wide between curbs and taps a large farming district, as well as forming one of the main touring routes to the mountain summer resorts and the Delaware Water Gap. Passaic avenue, entering the city from the southwest, is one of the contemplated main trunk highways of the new state highway system, and was formerly 40.2 ft. between curbs, but when completed it will have two 24 ft. roadways.

Preliminary Studies. The elimination of the grade crossings had been considered for a period of several years prior to the adoption of the final plan, but nothing definite was done until 1915, when the matter was finally pushed by the railroad company to a point of serious discussion.

Preliminary studies were made of alternative plans for elevation and for depression of the highways. A movement was also put under way by a body of property owners in the vicinity for the depression of the railroad. This was shown to be impracticable, after a thorough study by the city engineer, and the expense totally out of proportion with the benefits derived therefrom.

The plan to carry the highways over the right-of-way by means of a single bridge, as first proposed by the railroad company and advocated by a number of citizens, was also abandoned, due to the necessarily high embankments, steep grades, consequent damage to property, and danger of accidents.

It was finally agreed to depress the highways. Passaic avenue, already 67 ft. wide, was widened 12½ ft. on each side, a total width of 92 ft. being thereby obtained from the railroad to the southwesterly boundary of the Park, a distance of about 1,100 ft. Van Houten avenue was shifted about 80 ft. in a southerly direction, in order to obtain an easier and safer approach to the subway. The easterly side of Lackawanna place was also widened about 10 ft. The grades have been so arranged as to not exceed 6 per cent. at any place.

Damages and Purchase of Property. In consequence of the resulting damages, it was considered advisable to acquire certain property, and with this end in view a tract of 1.75 acres on the westerly corner of Passaic and Van Houten avenues was bought by the city. The acquisition of this property avoided excessive damage claims, allowed the shifting of Van Houten avenue, and made available a considerable amount of excavation which was used in grading other portions of the park, near the lake. This property was also a valuable addition to the park lands. Negotiations have also been completed for the purchase of the Barry property, on the north corner of the same streets.

The railroad company has recently acquired a long-term lease on a strip of park property along the westerly side of its right-of-way to provide for the extra fill required for tracks to be laid in the future. The property covered by the new station and grounds was also included in this lease.

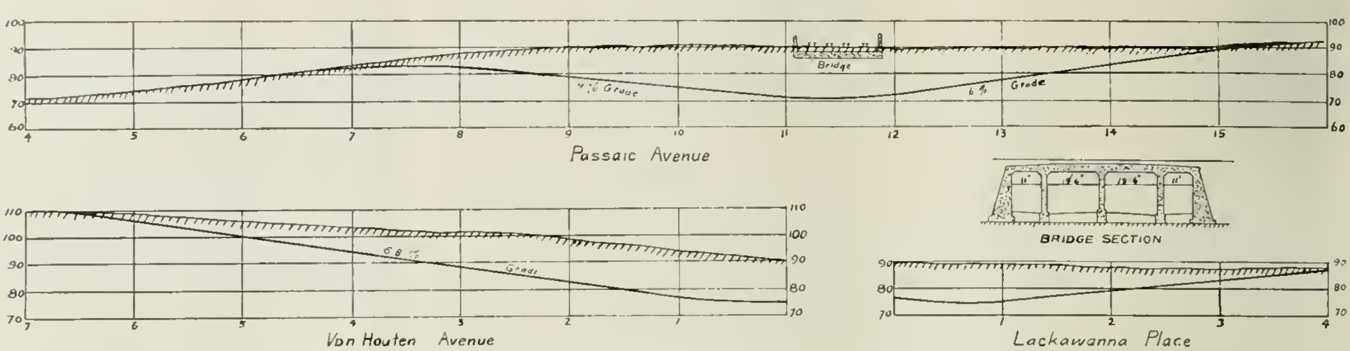
Ordinances and Contracts. An ordinance was passed by the Board of Commissioners on August 29, 1916, providing that the railroad company depress Passaic and Van Houten avenues, Lackawanna place and Richards street; fill in the park lands; construct temporary detours; build a new station and station grounds, and a subway between the stations, without cost to the city. In addition, the railroad company constructed the 42-inch storm sewer, the city agreeing to pay 50 per cent. of the cost of construction upon presentation of proper bills.

The ordinance further provided that the city do all paving and curbing and lay all sidewalks and separate sewers, the railroad company to pay $8,200 toward the cost of same. Also that the railroad company and the city share equally in the payment of such damages to property as might result, and in the cost of purchasing such property as was necessary. The title of all property purchased in this manner remains vested in the city.

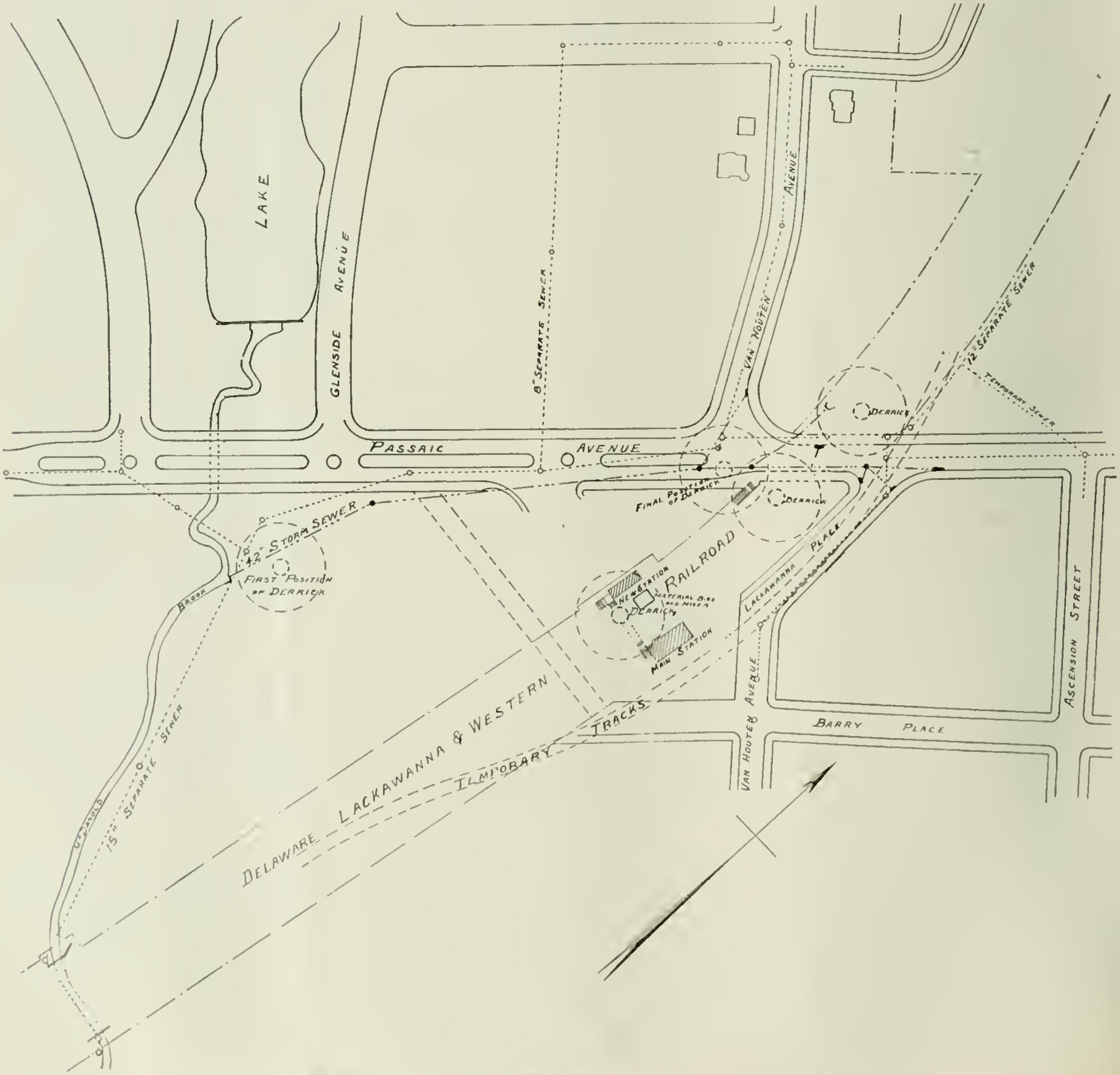
The contracts for portions of the work were let in the early spring of 1917, H. F. Curtis, Inc., New York City, obtaining the contract for the work for the railroad company. The Union Building and Construction Company, Passaic, N. J., was the successful bidder for the separate sewers, paving and curbing, and laying sidewalks on all the streets affected, with the exception of the Van Houten avenue pavement, which will be laid by the county.

Grading. The work was started in April, 1917, by grading the portion of the park property to be used for the new station and grounds. This grading, as well as all of the excavating for the depression of the various streets, was accomplished by a Marion Model 80 steam shovel, with a 2½ yd. dipper, which loaded the spoil onto narrow-gauge side-dump cars of 6 cu. yds. capacity.

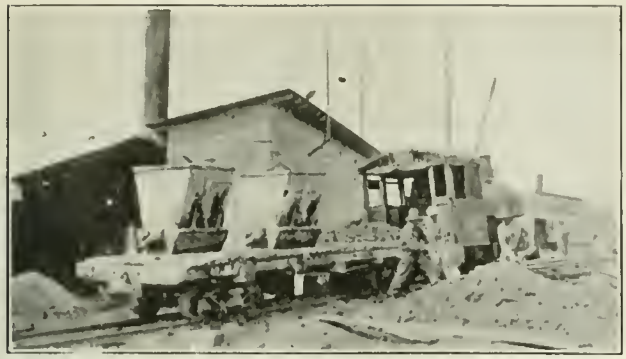
The shovel then proceeded in a northwesterly direction across Passaic avenue to the "Burns Tract," which was cut down several feet. The equipment was then returned to Passaic avenue and worked down-grade toward the railroad and hence northwesterly along Van Houten avenue to Richards street and Bradford avenue,



PROFILES OF STREETS GRADED, SHOWING ORIGINAL AND NEW GRADES.

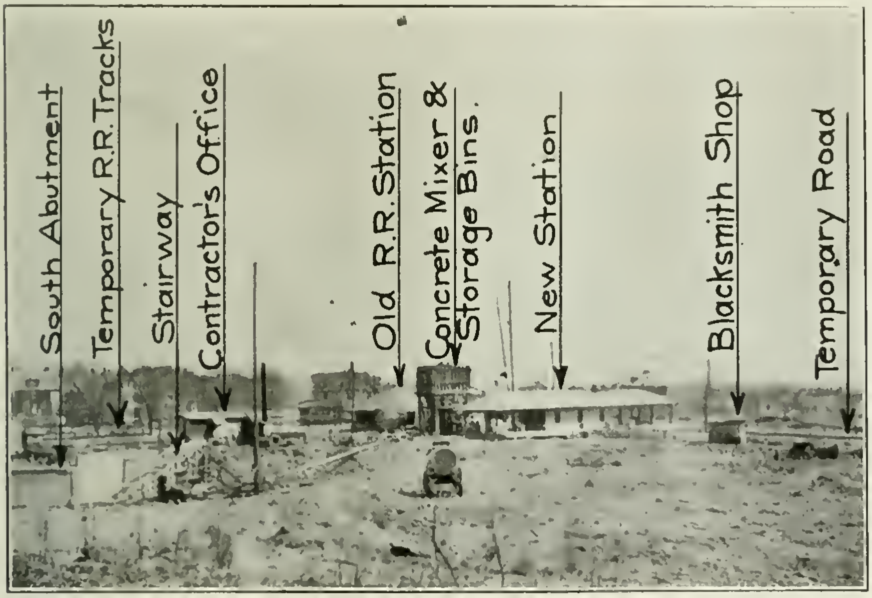


GENERAL PLAN OF AREA AFFECTED BY REGRADING.



FLAT CAR WITH CONCRETE BUCKETS.

afterwards returning to Passaic avenue to complete the excavation for the bridge site. The spoil was removed by two trains of four dump cars each. The material removed from the two streets was used for filling the park land near the lake, and for widening the railroad embankment south of the station. Rock was encountered at a depth of 15 to 18 ft. below the original street surface and was removed by drilling and blasting.



GENERAL VIEW, SHOWING NEW STATION AND CONTRACTOR'S PLANT.

A small Thew revolving steam shovel with a ¾-yd. dipper was used for trimming and terracing the southerly slope of Van Houten avenue, and for the light grading on Richards street and Bradford avenue and at the upper end of Van Houten avenue. The balance of the excavating, northeast of the railroad, cannot be started until the new bridge is completed and the temporary tracks are removed.

Concrete Plant. The abutments for the four-track reinforced concrete slab bridge were founded on solid rock, and were constructed rapidly with concrete mixed at a central plant located at the railroad station, about 300 ft. from the south abutment and 475 ft. from the north abutment.

The plant consisted of a 1-yd. mixer, driven by a vertical steam engine, into which the sand and gravel were discharged directly from an elevated storage bin of 120 cu. yds. capacity. The concrete was discharged directly from the mixer into two 1¼-yd. buckets carried on a narrow-gauge flat car, and thence conveyed to the abutments.

Three buckets were used in the concreting operations, one being emptied while the other two were returned to the mixer. The buckets were handled by ten-ton derricks located at each abutment. Three hundred and twenty cu. yds. of concrete were placed in 15 hours by this method.

New Station and Subway. A new brick and limestone station, with a concrete platform, has been built on the westerly side of the tracks, opposite the old station, but is not yet fully completed. The old and new stations are connected by a new reinforced concrete subway for pedestrians, under the main tracks.

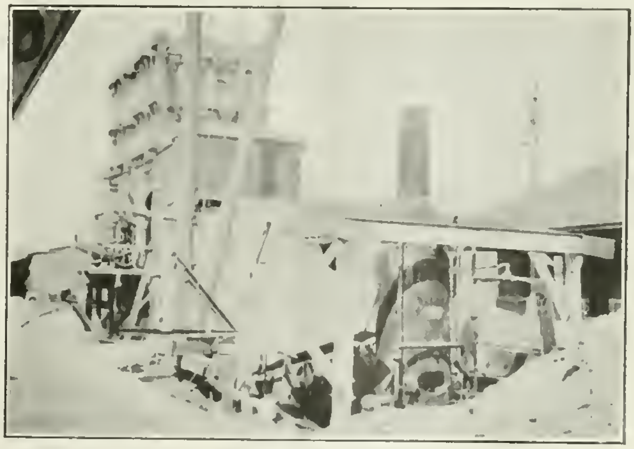
Storm Sewer. The construction of a 42-inch reinforced concrete storm water sewer from McDonald's brook to Van Houton and Passaic avenues was made necessary by the collection of a large quantity of storm water at the low point in the grades of those streets near the bridge. The trench was excavated and backfilled by means of a derrick with a clamshell bucket and 75 ft. boom, which was shifted along the trench as the work proceeded. The pipe was placed by means of a large hook made from a steel rail and attached to the main falls of the derrick.

Separate Sewers. Owing to the changes in the street grades, it has been necessary to provide for the construction or replacement of about 1,600 ft. of 15-inch and 3,000 ft. of 8-inch vitrified pipe separate sewers, to cost at completion about $15,600.

The 15-inch sewer, which acts as an interceptor, was carried under the railroad embankment by means of 16-inch cast iron pipe incased in concrete, passing through the opening formed by the stone culvert over McDonald's brook. The 8-inch sewers have been completed through the park and Bradford avenue and through Van Houten avenue; those northeast of the railroad will be constructed when the grading is completed.

Retaining Walls. Gravity type concrete retaining walls, with stairways incorporated, have been constructed in front of three residences on Van Houten avenue, in accordance with the agreement with the railroad company. In addition, $5,600 damages were paid the three owners.

Pavements. Pavements, curb and sidewalks will be laid on the various streets and avenues as follows: Passaic avenue, sheet-asphalt on concrete base, 9,500 sq. yds.; Van Houten avenue and Lackawanna place, "Amiesite," 4,400 sq. yds.; Richard street, Barry place



CONCRETE MIXER AND MATERIAL BINS.

and Ascension street, asphalt-bound macadam, penetration method, 3,500 sq. yds.; 8,200 lin. ft. of concrete curb; 28,000 sq. ft of concrete sidewalk. The asphalt-bound macadam pavement on Barry place was laid in the summer of 1917, to accommodate the increased traffic due to the use of the street as a detour.

Park Development. As a part of the general scheme, the adjoining portions of the Third Ward Park are to be improved by the city. In general, the improvement consists in grading and developing, on a conventional plan, the portion of the park west of Passaic avenue, and a new baseball field southwest of the station. It is the intention to develop the neighborhood into a fitting entrance to the city.

Cost of Improvement. Figures relating to the cost, amount of excavation, etc., of the railroad company's part of the work could not be obtained by the writer. The city's share amounts to approximately $106,425, not including the park development, which will probably extend over a period of several years. The cost is divided as follows:

Pavements, curb and sidewalks, not including pavement on Van Houten avenue	$46,000
Amiesite pavement, Van Houten avenue	5,700
Grading property formerly of M. F. Burns	8,600
Separate sewers	15,600
Storm sewer	7,500
Property purchased	19,000
Damages	4,025

The work is being done for the railroad company by H. F. Curtis, Inc., contractors, of New York City, and for the city by the Union Building and Construction Co., of Passaic, N. J. J. G. Ray is chief engineer of the D., L. & W. R. R., and Colin R. Wise is city engineer of Passaic, N. J.

TRAFFIC LAWS AND HIGHWAY MAINTENANCE AND CONSTRUCTION.*

Destructive Effect of Speed on Different Kinds of Roads, with Different Tires and Loads—Uniformity of Speed Regulations.

By CHARLES CARROLL BROWN.

SPEED.

Comprehensive speed regulations must be formed after a careful study of the relations of speed, weight of cars, surface of road, kind and design of tire, and condition of road bed. The limits for gravel, macadam, bituminous macadam and asphalt macadam were stated by Mr. McLean in saying that a light car can travel at 18 or 20 miles an hour over such roads without seriously injuring them, whereas heavy cars at 40 to 50 miles an hour wear the road out rapidly, largely because of the shearing action of the rubber-tired driving wheels upon the surface. This shearing action increases as the square of the speed, with the same car and weight. Thus the destructive effect at 20 miles is four times as great as at 10 miles an hour, at 30 miles it is 9 times and at 50 miles is 25 times. If 20 miles is the limit of speed of a light car at which the shearing action of the traffic becomes serious, it is evident that at 50 miles the destructive effect will be 6.25 times as great and the road will require six times the repair, or say, if a road would last 6¼ years under light cars at 20 miles speed, it would last but 1 year under the same cars at 50 miles speed.

When the weight increases, the shearing action increases. There has been no statement of the rate of increase, but it is probably proportional to the weight, so that a car weighing 5 tons would, at the same speed, have five times the effect on the road as one of 1 ton. So the 5-ton car at 50 miles would have 31¼ times the destructive effect of the 1-ton car at 20 miles speed. While far from exact, these figures show the great necessity of regulating speeds over this class of roads, and of providing hard surfaces where weight, speed and amount of traffic must be greater than the softer roads can carry.

Steel tires are destructive of hard-paved roads, as well as of the softer surfaces, and require regulations as to form, size, weight and speed that are more restrictive than those for rubber tires, because there is practically no limit to the burden that can be put on a steel tire, while the rubber tire has rather definite limits of possible loads at a given speed (said to be 750 lbs. per inch of width) or possible speed with a given load, so that the inverse relation of speed and load has a tendency in the interest of economy to regulate the speed and load, it being necessary only to regulate the careless driver and the driver who fails to consider the principles of economy and pushes through at the expense of tires and with the exceptionally destructive effect of his defective tire upon the pavement after his rubber tire has begun to go to pieces.

In regulating speed, therefore, there must be

1. Differences according to the nature of the road, as constructed of
    - a. Gravel and macadam.
    - b. Bituminous and other well bound gravel or stone macadam.
    - c. Paved roads.

It may be that paved roads should be divided into block and monolithic, though the present tendency is to construct block pavements in such manner as to be practically monolithic and to reduce to a minimum expansion joints in pavements that would be monolithic without them; and it may be assumed as probable that the pavement of the future will be monolithic.

2. Differences in tires.
    - a. Pneumatic.
    - b. Hard rubber.
    - c. Steel.
    - d. Defective tires.
    - e. Chains and other temporary appliances affecting contact of tire with road.
3. Differences in loads.
    - a. Total load on vehicle.
    - b. Total load on one axle.
    - c. Load on one wheel.
    - d. Load per inch width of tire.
    - e. Load on motor truck.
    - f. Load on trailer.
    - g. There should be added a division for loads on horse-drawn vehicles, speed of which is limited by the speed of the horses, and loads on which should therefore be subject to regulations different from those made for motor vehicles.
    - h. Diameter of wheel and its effect on load and speed.
    - i. The kind of springs on the vehicle and their effect on load and speed.

The inter-relation of these three classes of variables affecting the economical speed of the vehicles have not been studied carefully and as a consequence each authority establishing speed regulations has constructed them to fit the conditions and information nearest at hand. There are therefore many differences in regulations, and trucks fitting the laws of one state or the ordinances of one city cannot be used in the next state or city, without violating its regulations. New Jersey seems to have made a more intensive study of the problem than any other state, and its regulations seem to fit fairly well the conditions in that state, particularly those of the road surfaces; but they do not cover all conditions and must be broadened somewhat in all three of the divisions made above.

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*Concluded from page 326.

Now that motor trucks are becoming freight carriers for short hauls, they must pass from state to state, across many counties and through many cities and towns. It is very necessary, therefore, that there be uniformity in traffic regulations. It is possible in the regulation of speed, to make the rules cover all kinds of road surfaces, all kinds of tires, all weights of load, without reference to whether the particular state, county or other municipality has them all or not, as only those regulations could be enforced which apply to the local conditions. In this matter of speed regulation, therefore, it should be possible for the state authorities first to get together and agree upon a uniform system, which would then be adopted by or imposed upon the subordinate governmental organizations in each state.

The present variations in permissible speed of trucks under laws and ordinances (not including the judgment of the officers supposed to enforce them) are shown by the following from E. W. Stern's paper before the A. S. M. I:

Chicago, Ill.: Compatible with safety; 9 miles maximum for truck, 4 miles for truck with defective tire that would injure pavement.

Oakland, Cal.: 4-ton truck, 12 miles for rubber tires, 6 miles for iron or steel tires.

Massachusetts: 4 tons, 15 miles; 6 tons, 6 miles for iron or steel tires, 12 miles for rubber tires.

New Jersey: 4 tons, 12 miles with iron tires; 6 tons, 8 miles with iron tires, 10 miles with rubber tires. Proposed to rule out truck or trailers with iron tires, also lugs on tires or other metal except skid chains.

New York: Over 4 tons, 15 miles; over 6 tons, 6 miles with steel tires, 12 miles with rubber tires.

England: For iron tires, varies with weight on axle; for rubber tires, 12 miles for 6-ton truck; 8 miles if over 6-ton. If unladen car weighs 3 tons, 8 miles; if motor draws trailer, 5 miles maximum speed.

Instead of covering by strict regulations all the items affecting speed, it may in some states be desirable, at least so far as the cars licensed in the state are concerned, to fit the license fee in a general way to the destructive effect of the vehicle on the road. Horse-power and maximum possible weight (not rated capacity) together measure very roughly such effect and increase in fee with horse-power and with maximum weight of loaded car may fairly well impose on trucks their share of the expense of road maintenance due to their use on the roads. The fee should increase proportionately with the weight of the load and, beyond a standard minimum truck horse-power, should increase as the square of the horse-power.

Such license fees in lieu of some of the regulations of speed proposed may be justified in states where the roads are not yet improved enough to permit the general use of motor trucks and where population is so scattered as to reduce their use to a minimum in any event.

It may be possible also that regulations applying to hard-surfaced paved roads should not be adopted in states which are not constructing that class of pavements, but the use of trucks which require that class of pavements for their economical operation and which would wear out the roads of the state too rapidly should be prohibited or their use discouraged by high license fees and still greater restrictions as to speed than the standard of states with hard roads.

But, with a few exceptions as those mentioned, it should be possible to devise a set of speed regulations which could be adopted by practically all the states. They would act on the one side to standardize motor trucks and trailers and methods of using them, and on the other side to improve the standard of roads in all but the most highly developed sections of states which have taken the lead in road construction.

While such standard regulations might slightly retard some developments of the use of motor trucks, this would be offset by the standardization of trucks and their uses, and by the improvements in roads; and the regulations can be changed from time to time as the resulting orderly developments on both sides demand, and kept up to date and in full operation and effect.

SAN FRANCISCO'S MUNICIPAL BUS LINE.

The city of San Francisco operates a municipal bus line, said to be the first in the United States. It serves as an auxiliary to the municipal street railway system. Two lines of buses are run, one from the terminus of the street railway line at 48th avenue, the other across Golden Gate park.

The buses are operated by one man, who both drives the machine and collects fares, passengers paying as they enter. Each seats 18 passengers, while others can stand with the aid of sanitary straps. Electric-lighted route signals on the roof designate the terminal points. Regulation street car gongs, hand operated, are mounted on the roof. Electric push-button stop signals are placed opposite each seat. The cars were built by the White company. During the first five days of operation the three buses in service covered 728, 669 and 576 miles respectively.

SAN FRANCISCO'S MUNICIPAL MOTOR BUSSES.

Advantages of buses are that they eliminate the cost of power house, track, trolley wire and other features of trolley cars, both first cost and maintenance.

CONTRACT OR DAY-LABOR CONSTRUCTION.

Most of the counties furnishing the information tabulated in the April 20th issue stated whether or not work on each of the several classes of roads was done by contract or by day-labor. Of those reported, we find that all counties laid brick pavement by contract work, 95% of them laid concrete by contract work, 90% laid bituminous concrete, 63% laid water-bound macadam, 60% bituminous macadam, 55% gravel, 49% earth, and only 31% sand-clay. Speaking generally, this indicates that about two-thirds of the counties construct sand-clay roads by day-labor, one-half of them construct gravel and earth roads in that way, 40% construct bituminous and water-bound macadam, while not more than 10%

construct bituminous concrete, cement concrete, or brick. As the last named is generally laid on a concrete base, it may be said that very few counties did any concrete work by day-labor, but practically all of them let contracts for it.

It seems probable that a number of counties will this year do a greater amount of day-labor work than they did last, and that others will prepare to do such work that have not done it in the past. This is indicated by reports from a considerable number of the counties that they propose to purchase road machinery, such machinery including not only more than 150 road drags, more than 100 road graders and planers and about 50 scrapers, but also quite a number of concrete mixers, stone crushers, unloading devices, gravel screens, steam shovels, road rollers, scarifiers, as well as a very considerable number of motor trucks, tractors, trailers and dump wagons.

Counties that have no experienced superintendents or foremen to carry on construction work should undoubtedly let such work by contract rather than endeavor to perform it by inexperienced men, which can hardly fail to result in poor work and ultimate loss of money. On the other hand, there are several advantages in the construction of roads by the counties themselves, not the least being that, with machines and experienced men always on hand, the roads are apt to be maintained in better condition, repairs and improvements being made promptly wherever and whenever needed.

ECONOMIZING IN STREET LIGHTING.

Adopting Lamp, Globe, Reflector and Other Details to Secure Maximum Illumination of Street Surface with Minimum of Current.

In casting about for directions in which they can economize, cities should not overlook their street lighting. In many cases the power house or the lamps, or both, can be replaced with more efficient units, whereby equally effective street illumination can be obtained at appreciably less cost. Machinery may be difficult to secure under present conditions, and it may be owned and operated by a private company. But much can be done with new lamps, if those in use are not up to date. The use of old-type lamps at the present time is inexcusable. They should be replaced by modern high-efficiency lamps, which give two or three times as much light for the same energy.

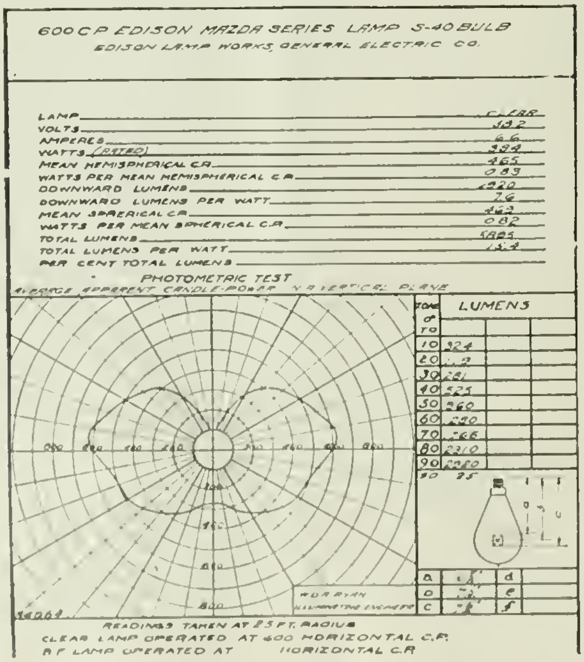

FIG. 1—LIGHT DISTRIBUTION OF MAZDA LAMP.

Perhaps the greatest economy in street lighting is effected by directing a large proportion of the light in a downward direction onto the street, where it is useful. In addition to directing the light downward, it should be spread out so as to illuminate the space between units when they are spaced reasonably far apart.

The foregoing applies to "utilitarian" lighting rather than to "ornamental" white-way lighting in business districts, where the units are usually spaced relatively close and the upward light is useful in lighting the building fronts, which in turn reflect some of this light back onto the street. Even in the latter case the unit should give more light below the horizontal than above it.

The term "utilitarian," when applied to a street lighting unit, generally means a unit which hangs pendent, fed from overhead lines, and is equipped to deliver practically all its light in the lower hemisphere. The term "ornamental" generally means one that is more or less ornate in design and appearance, mounted on top of a pole or bracket and fed from underground circuits. The first type is the one in general use for street lighting throughout the country and its purpose is to deliver the most light on the street surface for the least monetary outlay.

A bare Mazda lamp, with the usual type of filament construction, gives off light in all directions, and whether it is burned tip up or tip down, about the same amount of light is given off above and below the horizontal. Unless the lamp is equipped with some kind of reflecting or refracting device, to catch the upward light and direct most of it downward, a large proportion of the total light emitted by the lamp is wasted. While it is desirable to have some light above the horizontal, it would only be in some special case that more upward light would be wanted than downward.

FIG. 4

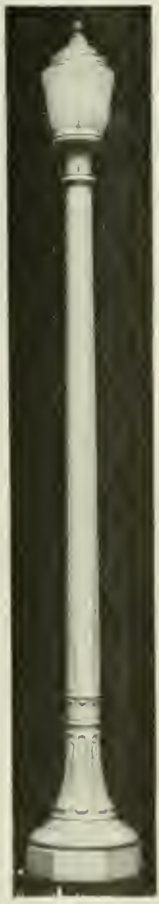

FIG. 2.

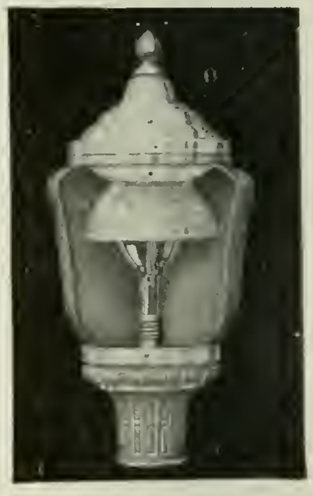

FIG. 3—GLOBE, REFLECTOR AND REFRACTOR.

In certain restricted areas, residential districts and boulevard sections, underground wires are necessary and a more or less ornamental unit is desirable which can be mounted on top of a pole, and yet the illumination desired is of the utilitarian class. The General Electric Company has recently developed a fixture suitable for this class of lighting, designed at the Form 8 Novalux ornamental unit, with stippled glass globe and dome refractor. The complete unit, mounted on a pole, is shown in Fig. 2. This unit is equipped with a 3-section stippled glass globe, an internal reflector at the top, supporting a Holophane prismatic dome refractor, as shown in Fig. 3.

The stippled glass globe has a high transmission factor and screens the interior equipment from view without very much interference with the characteristic distribution of the refractor. This permits an ornamental design of pleasing appearance and redirects into the street the upward light that otherwise would be wasted.

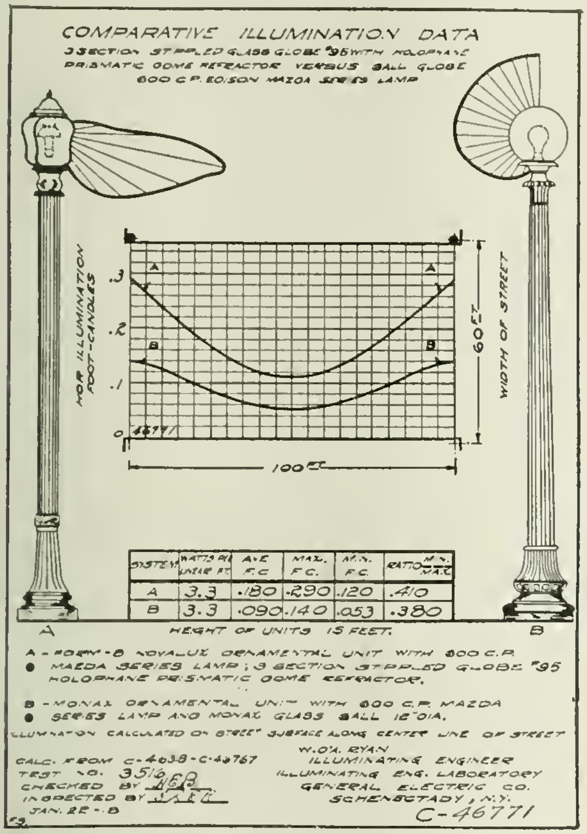

FIG. 6—ILLUMINATION ON STREET SURFACE.

A ball globe 12 inches to 18 inches in diameter mounted on top of a pole has been used to a considerable extent for lighting residential districts. But, while the appearance is good, it is wasteful, as more than half of the total light is above the horizontal. Fig. 5, plotted from tests made at the Illuminating Engineering Laboratory of the General Electric Company, shows the candle power distribution curves of the two units under discussion with a 600 C. P. Mazda series lamp. This illustrates more clearly than words can tell the saving in light effected by the new unit.

The illumination on the street surface, along the center line, has been calculated from the distribution curves of the two units and is shown on Fig. 6. This shows the units on one side of the street only, but the result will be approximately the same if the units are staggered and also if the units are placed in a row along a parkway in the center of a boulevard. If they are arranged parallel, the values would be doubled.

For the sake of ready comparison the essential data and relative efficiency of the two units are tabulated in the accompanying table.

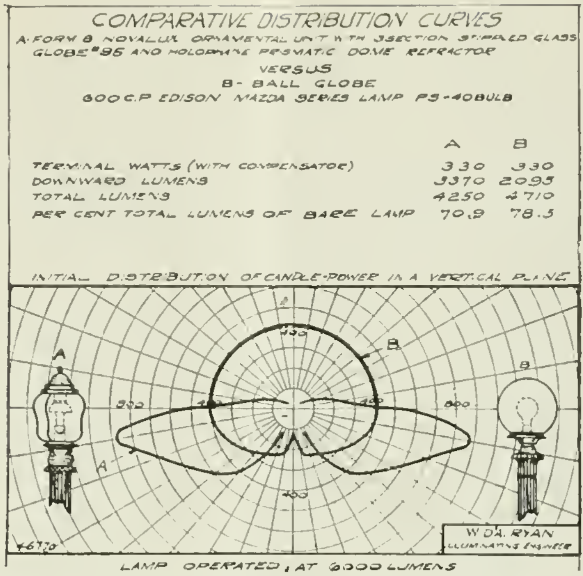

FIG. 5—COMPARATIVE LIGHT DISTRIBUTION OF TWO TYPES OF GLOBES.

Comparison of Ball Globe and Form No. 8 Novalux.

	Data		Relative Efficiency	
	Form 8	Ball Globe	Form 8 Per cent	Ball Globe Per cent
Upward lumens	880	2,615	34	100
Downward lumens....	3,370	2,095	161	100
C. P. at 80 degrees....	880	400	220	100
Watts per linear ft....	3.3	3.3	100	100
Average F. C.........	0.18	0.090	200	100
Maximum F. C.......	0.29	0.140	207	100
Minimum F. C.......	0.12	0.053	226	100

From this tabulation it can be seen that the upward light with the Form 8 unit is only 34 per cent of that from the ball globe unit. The average illumination on the street surface with the Form 8 unit is double that with the ball globe unit. This means that fifty Form 8 units will give the same illumination as 100 ball globe units and consequently only one-half the energy will be required, or fifty Form 8 units will give twice the illumination of fifty ball globe units for the same energy consumption.

NEW FEATURES IN CONCRETE PAVEMENTS.*

Hand Roller and Canvas Belt—Eliminating Waves——Resurfacing with Concrete—Hydrated Lime—Expansion Joints—Measuring Aggregates.

In concrete road construction several new features have been devised in the last few years. Probably the one that is now demanding the widest attention is the use of a hand roller in finishing the concrete. It is stated that slabs finished with the roller develop considerably more strength than slabs finished by an ordinary float. Not only does the roller increase the strength of the concrete, but it is stated that it also takes out the short waves that cause considerable vibration to traffic in passing over the pavement. A common way of manipulating the roller is to move it transversely across the pavement a certain period after it is struck off with the template. The effect of the roller is to consolidate the top layer of the concrete and remove the surplus water and take out the slightly uneven places that have been left by the template. Experience will tell best the right amount of rolling. After the pavement is rolled, it is ready to be finished with a canvas belt.

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*Part of paper before American Road Builders' Assn., by Chas. M. Upham, and discussion of same by W. M. Kinney.

In riding over concrete roads it has been found sometimes that there is considerable vibration or unevenness. This is a serious objection which should and can be overcome. On roads that have been constructed for some time a good part of this is due undoubtedly to the fact that sufficient care was not taken in finishing. It has been found that, even with extreme care with the template and in hand floating, there are still numerous waves in the concrete surface, and it is stated that it is practically impossible to get rid of this. After experimenting with various finishes, it has been found that the smoothness and evenness of the surface are practically determined by the condition of the side forms. A form that keeps a true alignment and is not easily bent and can be kept in a straight line is the one that will produce the smoothest pavement. It would indeed be a new feature to produce a form that will stand up and remain in good condition under the handling given by the contractor.

A new feature in the maintenance of concrete roads is the use of a tar kettle upon which are mounted a pump and hose. Considerable time is saved by the pump and hose, and a large mileage of concrete pavement can be maintained in a short time.

Another new feature in concrete construction is the resurfacing of an old concrete road with a concrete surface. This is now familiar to all highway engineers, and has practically been accepted as being a satisfactory method of resurfacing.

In the construction of concrete roads, the use of hydrated lime has demanded considerable interest and attention. Many laboratories have done considerable experimenting, but for some reason have not written a great deal on this subject. It appears that hydrated lime does not have the same effect upon different proportions of concrete, nor does it have the same effect upon different sands. It also appears that the beneficial effects of hydrated lime are within certain limits. In connection with the sand used in Delaware, the maximum benefit resulted when four per cent of hydrated lime by weight of the cement contents was used. It appears from the results that lime is not as beneficial to the stronger or weaker mixtures of concrete as it is to the intermediate. In other words, hydrated lime is found to be beneficial to the strength of concrete when used within certain limits. The length of this paper being restricted, it will not be possible to go into the details of these tests.

It is not a new feature, and it is practically now accepted by all engineers that the aggregate in concrete should be mixed for at least one minute. Certain experiments seem to show that continued mixing increases the strength up to four minutes. It appears, however, that the most economic time is between one minute and one minute and a half.

The question of joints seems to be one that has demanded considerable attention and it is now almost the general method to place a joint only at closing of work for the day, or no joint at all. Many experiments have been carried out by making each day's work as one large slab without a limit to its length. While no bad effects have resulted from this, it does not mean that transverse cracks are eliminated entirely. Inasmuch as it seems practically impossible to eliminate entirely these transverse cracks, it is considered good practice to regulate and provide a place of weakness in the pavement by placing a blind wooden joint underneath the surface at intervals from 50 to 200 feet apart. This regulates the location of the transverse cracks to a certain extent and makes possible a straight line crack instead of an irregular one. As a word of caution, there is a danger in not getting the wooden joints vertical. This would have the tendency for one slab to rise above the next. One other method that seems to be satisfactory and will insure no possibility of one slab rising above the other is to tie the different slabs together by iron rods which have been coated with tar or asphalt. This allows the concrete to contract and re-expand, but will not let one slab rise above the other. In this case the joint is treated and maintained exactly the same as a crack.

The use of calcium chloride in concrete, while not exactly new, is one that is creating quite an interest. Sufficient data are not available to show the ultimate results this may have on concrete roads.

In the construction of concrete, a new feature that has greatly reduced the cost of construction and assisted in producing a more perfete concrete road is the method of measuring the aggregates at the point of supply and carrying them to the concrete mixer in containers each holding one batch. Upon arriving at the mixer the concrete ingredients are dumped into the hopper in one operation and then mixed and placed in the regular way. This method does away with the placing of the aggregates on the subgrade, which would mean that considerable of the aggregate is lost and that the subgrade could not be kept in as good condition as with the central distribution method. It also means that the aggregates are kept much cleaner, which means that the finished concrete is so much better. It also means that the labor operation of loading the concrete ingredients from the subgrade into the hopper is entirely eliminated.

Several methods have been devised to carry out this system, but probably the most satisfactory one is the use of an industrial railway for hauling the containers which carry the aggregates to the mixer. The container is taken from the car and emptied into the hopper by means of a derrick attached to the concrete mixer.

In discussing this paper, W. M. Kinney, engineer of the Universal Portland Cement Co., cited a pavement laid in the Duluth plant of the cement company in which it was considered that dowels at the joints were absolutely necessary, and they were used successfully. In Commonwealth avenue, Duluth, they were made by using ⅜-inch rods set 12 inches apart. One end of each rod was tarred and the other end was left bare so that it could be held tight by the concrete in which it was set. After two winters, no differences in elevation at the joints had developed.

Concealed joints also are used successfully, made by placing a separating strip at least 3 inches below the top surface of the pavement. If the thickness of concrete above the strip is less than 3 inches, it is likely to spall off at the top at an angle, leaving a width of hole which makes it difficult to maintain the pavement.

As to variation in contour of concrete pavements, the committee of the American Society of Civil Engineers recommended that the variation in surface from a 6-foot straight edge parallel to the center line should not exceed ⅛ inch. There is no living contractor that can reach this requirement continuously. A pavement with not exceeding ¼-inch variation is difficult to find. A block of asphalt pavement which was considered to have a perfect surface had at least a half dozen places in which the variation was greater than ¼ inch. A bar has been built for testing rapidly and continuously the variations from straight edges of 2, 4 and 6-foot lengths; and this bar will be used for taking measurements on a number of pavements as soon as the weather permits.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

ENGINEERING STUDENTS AND THE WAR.

We have received from Dean M. E. Cooley, of the College of Engineering of the University of Michigan, a copy of a letter from President Wilson which we print herewith. The President's letter came as the result of resolutions prepared by a committee of engineering educators. The letter is as follows:

THE WHITE HOUSE
Washington

My dear Dean Cooley:

I understand that there is to be a meeting of the department superintendents of the American Educational Association in Atlantic City on the twenty-fifth of next month. I would like very much to be present in person at that meeting, but since I cannot be, may I not ask you to express to the gentlemen assembled there my very great concern that none of the educational processes of the country should be interrupted any more than is absolutely unavoidable during the war.

My attention has lately been called in particular to the falling off in the number of engineering students and this has given me a good deal of concern, because it is not only immediately necessary that as many students as possible should prepare themselves for engineering duties in the Army and Navy, but it is also of the first consequence to the country that there should be an adequate supply of engineers for the period of reconstruction which must follow the war.

Not only has technical training become of enormous importance in military operations, but the role of the engineer has become more and more important in every process of our industrial life, and I hope that influences may go out from the meeting in Atlantic City which will call the attention of parents throughout the country to the importance of making any sacrifice that it is possible to make to keep their sons in the schools even during these trying times.

Cordially and sincerely yours,
WOODROW WILSON.

Commenting on this, Dean Cooley states that thousands of engineers are in France, there being from five to six thousand engineer officers in the army service early this year. The attendance at engineering schools has fallen off 25 per cent to 35 per cent and hardly a day passes without calls from the army or the navy for the services of members of the higher classes in the engineering schools, and the engineering graduates this year will probably be only half the usual number.

As a class, engineers are keen for active war service, and there will of a certainty be casualties among them. This, with the reduced number of graduates, will decrease the number of engineers after the war. But the demands for engineers to repair the destruction of war, to rejuvenate railroads, roads and plants worn out by the unusually strenuous service they are being called upon to render, and to catch up in general construction work that is being postponed because of the war's necessities, will be greater than ever before. The result will be a shortage of engineers and the use of improperly qualified ones that may be almost disastrous to ourselves and other nations that will look to us for help in their reconstruction activities after peace has been declared, unless immediate action is taken.

To meet the coming emergency, the engineering classes in our colleges should be doubled rather than halved. It is of the greatest importance that all engineering students remain to graduate who can do so, and that thousands of boys with engineering talent be persuaded to enter engineering schools.

There were excellent reasons for our being unprepared for war. We can see none why peace should find us equally unprepared.

THE INSTABILITY OF MUNICIPAL REFORM.

It is with real regret that we have recorded the death of Rudolph Blankenburg, former mayor of Philadelphia, the "War-Horse of Reform." For thirty years he fought in every bitter battle for civic decency against the intrenched forces of the autocracy of boss politics. He was a true civic sanitarian in his devotion to the task of disinfecting one of the worst festering political sores in the country. For four years, while he was mayor, the forces of right held power. Yet he lived to see those whom he opposed recover their hold on the city. Before he died the shooting scandals of the last primaries startled the city into a protest of outraged helplessness—and only a few weeks ago the United States government held his city up to the scorn of the nation as the worst vice spot in the country because "responsible city officials" are "in intimacy with those who profit by the continued existence of vicious conditions."

It has become a commonplace that no American municipality "stays reformed." University theoreticians and practical civic leaders are alike hurt and discouraged by the apparent hopelessness of the electorate in its inability to distinguish between right and wrong—its susceptibility to political change—its ingratitude.

Too often we all have mistaken book-keeping for revolution and a card index for basic reform of democracy. Eliminating graft, whether it is petty or gigantic, is a transitory fumigation. Installing a measure of scientific management in administration means only that the taxpayer's dollar will bring him a few more cents' worth of service. Experimenting with election machinery, inventing new brakes, governors and exhausts gives us a feeling of democratic power and a sense of efficient self-expression. Charter changes and new forms of government help sweep out some of the cobwebs and fungi of official routine. They serve to focus authority and responsibility. But politics can work with few men as well as with many. We have had all these reforms in different cities at various times—they have been clutched by the voters like toys and then thrown away after a little while or else appropriated by the powers of evil for their own ends.

Much of what has appeared as reform has been but a raid on office by the politicians of the outside party and the citizens have been deluded into mistaking the brass band for a call to arms, the red fire for a torch and the campaign bunk for a crusade. And the leaders they have swept into city hall have shut the doors in their faces and they wait until next election day for the gang they had put out to lead them back again.

Disillusioned reformers say that the people do not know what they want—that they do not want good government. Perhaps the reason is that the people do not recognize good government when they see it. Is it because, when they have had a reform administration, it has had merely an appearance of goodness and has had no real effect on their daily lives? Or is it that the benefits have been real, but not pointed out to the citizens? If the second is the cause, then we have failed in the elementary task of education, we have not visualized good government. Perhaps, if we could convince the voter permanently that when he enters the booth he may be voting for life or death for his child, he would mark his cross in the right place. Perhaps we have not been able to prove to him that there is no such thing as Democratic sewers or Republican sidewalks—or that the tariff has nothing to do with the organization of the grade school.

But if good government is not a real thing, and voting is merely an annual amusement and does not mean anything, that is more serious. City government must then be accused of not touching us at the vital points of our lives, of being superficial, of being unintelligent.

They say democracy is a failure. The remedy is more democracy. They say that "we cannot change human nature." Perhaps the fault lies in our not understanding human nature.

Rudolph Blankenburg lived and is dead—and Philadelphia is still Philadelphia.

RECENT METHODS OF APPLYING BITUMEN.

In a discussion before the American Road Builders' Association, P. P. Sharpless, engineer of the Barrett Company, referred to some of the more recent developments in the use of tar and asphalt in road construction. Tar-and-gravel concrete had been mentioned as novel, but Mr. Sharpless said that Mr. Clark had used such concrete for years in Concord, grading the gravel and proportioning the tar by trial and arriving quite closely at the Topeka specification; much of the success probably being due to complete control by one man of the materials and proportioning, which, while not always the best according to modern notions, were varied to suit each other and produced very satisfactory results.

Where gravel is used for surface treatment, it must be properly selected. Maine and Massachusetts have used cold tar and gravel for some time, usually giving two surface treatments the first season. A gravel road is not generally uniform, and soft pockets show up which break the surface and which should be patched. If this breaking of the surface is due to frost, the road must be scraped and scarified and must usually be retreated also, though sometimes no retreatment is necessary.

The "tar-puddle" methods developed and applied by Shirley in Maryland and Hurst in Wisconsin are excellent, and yearly treatments are not necessary where they are followed. It is believed that this method was first used in 1910.

In Wisconsin there are soft sand districts where absolutely no road-making materials are to be found, and here the sand-hay road has been developed. The tough marsh hay used by farmers to make these roads possible soon rots and the roads go to pieces. The state highway commissioners have tried covering the hay with refined tar, then adding more hay with or without a layer of sand between. More tar is added on top of the upper hay layer, and then sand to smooth out the surface. The road irons out and becomes quite smooth and requires much less repair than those in which the tar is not used, and is passable for much longer periods.

The mixing method of using cold bitumen for cold patches or treatment is probably better than the penetration method, using either cut-back or emulsified tar. This method is valuable in city and suburban street work where traffic is light, as well as in maintaining country roads.

MALDEN FIRE DEPARTMENT ITEMS.

In his report for the year 1917, John H. Hannan, fire commissioner of Malden, Mass., mentions several improvements which were effected during that year. Some of the more interesting of these are as follows:

An acetylene welding and burning outfit was installed, which saves time, labor and expense, and enables the department to do itself a considerable amount of work which formerly had been sent to Boston.

The stock system has been installed and extra parts of the various pieces of apparatus are now kept on hand for emergency, which obviates the necessity of keeping cars out of commission while sending to the manufacturer's for spare parts. All hydrants in the city were painted, the high-pressure hydrants being given red tops and the low-pressure hydrants silver tops.

The number of alarms during the year was the lowest for several years past, which is attributed to the fact that the public had been educated by display advertising in the local papers and that rigid inspection was made of the yards of buildings and other hazardous places and dangerous locations.

During the year, four members of the fire department joined the army, one of them being in the service as first lieutenant and another as corporal.

TREATMENT OF INDIGENT SICK IN TOLEDO.

In our issue of April 6th, on page 286, we published a news item from Toledo, O., attributing to Joseph Kelsey, "Director of the Division of Health," the statement that "it is cheaper to pay railroad fare for sick and indigent to other cities than it is to take care of them." We have received from W. S. Johnson, secretary of the Commission of Publicity and Efficiency, a request to correct this item, which in justice to Mr. Kelsey we are only too glad to do. Mr. Johnson informs us that the statement referred to was made by Dr. C. C. Dreyer, former commissioner of health, in his annual report for 1917, and not by Joseph Kelsey (whose title, by the way, is Director of the Bureau of Public Health Instruction, a branch of the Division of Health). Mr. Johnson says that a probable explanation of the mistake is that our informant found Mr. Kelsey's signature at the end of the annual report, the report of his bureau being the last in the published report, and assumed that he was responsible for the entire report.

Very properly, it seems to us, Dr. Dreyer has been forced to defend himself from several severe criticisms for expressing the above idea, and has been removed from his position as head of the Division of Health.

The WEEK'S NEWS

Pennsylvania State Highway News—$2,000,000 Sewage Disposal Plant for Indianapolis—Buffalo's Housing Problem—U. S. Eliminates Typhoid and Dysentery from Army—The Marin, Cal., Municipal Water District Grows—Public Service Commission Has No Power to Raise Gas Rates in New York—Navy Department "Takes Over" Philadelphia Police in Vice Fight—Debt of California Cities—Municipal Information in Pennsylvania—Car Fare Regulation in Missouri—Seattle and Tacoma Vote on Municipal Railways.

ROADS AND PAVEMENTS

Highway Commissioner Indicted by County Judge.

Lock Haven, Pa.—Judge McCormick of Clinton county has ordered J. Denny O'Neil, state highway commissioner, indicted because of the condition of the state highways near Avis. The highway department has promised on numerous occasions to make the necessary repairs, but no action has been taken. A constable was sent to Harrisburg by the district attorney to serve a warrant on commissioner O'Neil. Commissioner O'Neil, when interviewed, said that he knew of no complaints from Clinton county and that plans are maturing for road repairs in that section. "As for indicting the highway commissioner for failure to repair roads," Mr. O'Neil said, "that was tested out during a former administration and was found to be illegal."

Road Contractors Must Hold to Bids.

Harrisburg, Pa.—Bidders on the state highway work and contractors generally have been informed that under the law the state will have to hold them to their bids and forfeit deposits. Recently instances have arisen where contractors have been awarded contracts who were unable to secure bonds and lost money deposits.

Railway Company Need Not Repair Settling Pavement.

New York, N. Y.—The appellate division of the supreme court has decided in favor of the defendant in the case of the city against the New York Railways to recover $2,161 for pavement repairs on Lexington avenue. The case involved the question of the duty of the railway to maintain pavement after temporary restoration following subway construction. In this instance, at the completion of the subway work, the contractors restored the pavement, but at the end of six months it had settled so that repairs became necessary. The city notified the company to repair the pavement in the railway area. The company refused to comply, contending that the contractors were responsible for the restoration of the pavement to its original condition. The decision is regarded as very important in New York, since most of the paving along the new subway lines is affected to some extent.

SEWERAGE AND SANITATION

Decide on Sewage Disposal Plant for Indianapolis.

Indianapolis, Ind.—Resolutions providing for the building at Seller's farm, which is situated southwest of the city, at the junction of Big Eagle Creek and White River, of a sewage disposal plant, at an estimated cost of $1,912,000, have been adopted by the board of sanitary commissioners of Indianapolis under the provisions of the sewage disposal law enacted by the last legislature. A public hearing has been held for persons affected by the resolution or those who are interested in it. The resolution states that the board has found that the water in White River is being polluted by the sewage from Indianapolis, and that a sewage disposal plant is necessary. Preliminary plans, maps, drawings and specifications have been prepared. Before the commission, however, can issue the bonds to raise the money for the work it must have the approval of the federal reserve board. Seller's farm contains 184 acres. On this farm is situated the garbage reduction plant of the Indianapolis Reduction Company. The sanitary commission is considering buying this plant, and if it is bought it will become a part of the sewage and garbage disposal system of the city. The estimate of the cost of the sewage disposal plant, as fixed by the sanitary board, is as follows:

Intercepting sewer and rights-of-way, $200,000; pumping station and suction well. $100,000; coarse screens, grit chamber and Venturi meter, $40,000; fine screens, $182,500; building and substructure for screens, $50,000; sprinkling filters, $900,000; settling tanks (2.4-hour retention), $160,000; sludgo pumps and force mains, $10,000; concentrating tanks, $25,000; sludge pressing and drying plant, $140,000; main outside conduits and outfall, $75,000; administration building and laboratory, $15,000; water lines, $9,000, and lighting, $5,500; total, $1,912,000.

An enormous conduit will be constructed from a point near Wisconsin street, just west of Senate avenue, to pick up the sewage from the interceptors, which now empty into White River. The conduit will run to the Seller's farm, where the sewage will be treated and turned into fertilizer for commercial purposes. The present plans call for the pressing of the sludge and the selling of the product for fertilizer. Jay Craven, secretary of the board, has recently made trips to Milwaukee and Chicago, where he investigated the plants there where sewage is treated for commercial uses. The board of sanitary commissioners is composed of Henry W. Klausmann, city civil engineer, president; C. H. Hurd, vice-president, and Jay Craven, secretary. Application for permission to issue $200,000 worth of bonds for a garbage reduction plant has been made by the commission, and Samuel Ashby, corporation counsel, who went to Washington, reported a favorable decision from the federal capital issues committee.

Housing Conditions in Buffalo.

Buffalo, N. Y.—The sanitary inspectors of the health department recently completed a housing census which gives full knowledge of how every house in Buffalo is occupied. Buildings numbering 535 were found occupied by three or more families of which there was no tenement house record; consequently these buildings will be treated as unlawful structures occupied by more than two families in violation of the New York state tenement house law, unless the owner proves the building lawful. The inspectors also found several hundred buildings converted into rooming houses in violation of the city ordinances. The census shows the following:

One family houses	33,175
Two family houses	25,847
Tenement houses occupied by more than two families. living independently of one another and doing their cooking upon the premises	4,309
Rooming houses	1,075
Lodging houses	50
Boarding houses	94
Hotels	76
	64,625

The census has shown quite conclusively that there are very few vacant houses or apartments in the city. Families have doubled up, others taking in roomers and boarders. One and two family buildings have been converted into unlawful tenement houses. These will be reduced by the department when orders are issued in accordance with the state tenement house law. Hotels, apartment houses, tenements, boarding, lodging and rooming houses are filled, and many private dwellings converted into rooming houses in violation of the city ordinances. These will be made to comply with the ordinances. Labor camps have been established by the railroads in various sections of the city to house their laborers. Houses have not been erected in pace with the growth and increased population of the city. Only four tenement house plans were approved during the past year, with a total of 41 apartments. There is a big demand for small apartments within walking distance of the business section. The street railroad company's transportation facilities are not keeping up with the growth of the city to warrant development for housing people on the outskirts of the city.

The department's inspection service was reorganized during the year to improve the service and facilitate the work in general. Prior to this the work of sanitary and tenement house inspectors were constantly overlapping each other. Under the reorganization plan, the city was laid out into sixteen districts to harmonize with the Charity Organization and health center districts. The inspector is held strictly accountable for the sanitary conditions in his district and must be able to report on all violations of the state tenement house law, and also of the city ordinances.

Government Cuts Sewer Bond Issues.

Detroit, Mich.—More than half of Detroit's proposed $8,000,000 sewer building program cannot be carried out this year. The capital issues committee of the federal reserve bank will not approve more than $3,000,000 worth of sewer bonds, city controller George Engel has been informed. Practically the entire proceeds of these bonds will be needed to pay for the five sewers, for which bids already have been received. Men and materials needed for municipal improvements are considered by the issues committee more than is the money phase, according to Mr. Engel. There are bond issues amounting to about $15,000,000 in the 1918-1919 budget, all of which will have to be approved by the capital issues committee before they can be sold.

Erie to Build Creek Tube in Sections.

Erie, Pa.—Council has asked Farley Gannett, consulting engineer on the Mill Creek flood protection sewer, to prepare plans so that bids can be called for on the completion of one or more sections this summer. On the advice of Mr. Gannett council decided to complete the tube from 21st street to 28th street and at the outlet of the stream. This will be done in sections, and council will ask for separate bids on each division of the work. After completion of any section of the tube the city engineer will be directed to furnish a report covering its cost. The city will appropriate such money as it deems possible for the completion of the work. The court will be asked to appoint viewers to hear all reports of damage by adjoining property owners. All such damage will be settled by the city. The new ordinance embodying this action repeals all others dealing with the Mill Creek tube. Owing to the fact that council relet the Metz and Roth contract to the George Cantrell Company it is forced to ask that concern to waive its contract on those sections of the tube which the city decides to build. The city will appeal the decision of judge Rossiter, reported last week, to the state supreme court. City solicitor Gilson contends that judge Rossiter did not pass on "The city's right to let contracts on the cost plus basis and what is a sufficient appropriation for the work and if bonds are considered an appropriation for it."

Army Eliminates Typhoid and Dysentery Menace.

Washington, D. C.—Official figures given out at the office of the Surgeon General show that there have been but eight deaths from typhoid fever in army camps in the United States since Sept. 21, 1917. Dysentery has been stamped out for the first time since wars began. There has not been a single death from this cause and there are no cases now under observation. The records show that but a single suspected case of typhoid is under observation at present. The sick and death rates from this disease are so small as to be considered negligible. Reports by the Surgeon General's office show that during the Spanish-American war the death rate from typhoid was 8.79 per thousand. If that rate were effective today the American armies, on the basis of 1,500,000 men in the service, would have lost from 13,000 to 15,000 men because of the ravages of this disease alone. A campaign is now being conducted to prevent the outbreak of dysentery in the camps during the summer, and the officials are confident that it can be held in check. It is believed also that the danger of a large number of deaths from typhoid has been definitely averted as a result of the advanced methods adopted. Reports from abroad indicate that typhoid as well as dysentery has been stamped out of the overseas army as a result of the system of inoculation and the other sanitary precautions taken.

WATER SUPPLY

Municipal Water District Expands.

San Rafael, Cal.—The Marin municipal water district has voted to take over the Belvedere and Fairfax water systems and operate them as part of the big $3,000,000 project, which is rapidly nearing completion. This addition to the system means that municipal water is now being served to the residents of San Rafael, San Anselmo, Fairfax, Ross, Kentfield, Corte Madera, Larkspur, Mill Valley, Sausalito, Forts Baker and Barry, Angel Island, Tiburon, Belvedere, San Quentin, California City, McNear's Point and Lagunitas. The district paid $10,000 for the Fairfax distributing system of Frederick Croker, and $25,000 for that part of the Belvedere system taken over. The Larkspur and Corte Madera systems were added to the properties of the district about three months ago. The directors also decided to take over the Baltimore Park system of W. L. Courtwright as soon as the title can be transferred. This will give the district control of every water-serving property in Southern Marin County. The district's system will have cost $3,000,000 by the time it is completed this fall. A new reservoir is being built in Lagunitas canyon, with a concrete dam at Alpine, costing about $350,000, and which, it is claimed, will provide sufficient water for the district for the next twenty-five years. Work on the second unit of the new system, the Pine Mountain tunnel conduit, through which the new reservoir will be connected up with the present system, is nearly complete. Work on the concrete pipe line connecting up the reservoir with the tunnel has been commenced. General manager John Burt estimates that the entire system will be in operation this fall, in time to catch and store the winter's rains.

Poor Storage Records Cause Pipe Loss.

Detroit, Mich.—Dadson, Burnell & Co., accountants, have filed their formal report of their investigation of receipt and disposal of water pipe by the board of water commissioners from July 1, 1915, to December 31, 1917, in recorder's court, and the report states: "There is an apparent shortage of 510.27 tons of cast iron pipe of a value of $15,563.24, consisting of pipe, shown by the records of the board, to have been delivered to proposed water main locations, but not reported as laid, and yet unaccounted for." The report of the accountants is the sequel to judge William F. Connolly's grand jury inquiry into water board affairs, and besides listing the apparent shortage of water pipe of nearly all sizes the report sharply criticizes the handling of pipe and records at the storage yard of the water board. "The bookkeeping at the storage yard has been so poorly done as to make an accurate audit extremely difficult," the report states. "Few of the books and records of the storage yard examined were found to be reliable or accurate. The only records which could be verified with absolute accuracy were those relating to purchases of pipe. Invoices covering all purchases were readily accessible and in good order. The delivery tickets contain manifest errors; the transfer tickets do not represent all transfers made, and the stores ledger, purporting to account for material received and issued, contains many fictitious entries. The storage yard records are made up in such a slovenly and careless manner as to facilitate the possibility of undetected shortages. As the pipe issued by the storage yard has been so carelessly accounted for it will be apparent that the charges made to individual jobs for pipe delivered are not dependable, and there is no assurance that material intended for jobs reaches the proper destination. Ordinarily there is no responsible person at the jobs to receive the material, and if the driver should deliver an occasional load to some junk dealer there is no certainty that the shortage ever would be discovered. We have been advised that duplicate deliveries sometimes have been made in instances where pipe was not found at certain locations to which it was supposed to have been previously delivered without investigating where it might have gone." At another point in the report the delivery ticket situation is handled in this manner: "Blurred, illegible and otherwise undecipherable delivery tickets might have caused some clerical inaccuracies in obtaining a total of deliveries, but could not possibly have accounted for the serious discrepancies in the results reached. It seems clear that the delivery tickets did not in all cases represent actual deliveries or fully account for returns to the storage yards, nor were these returns fully accounted for on foremen's transfer slips provided for the purpose."

City Reduces Water Rates for War Gardens.

Pocatello, Idaho.—E. F. Ferer, water superintendent, has inserted the following official advertisement in the local newspapers, announcing a reduction of 50 per cent. in rates for water used in war gardens:

> "Water for war gardens from metered services. By order of the city council a reduction of 50 per cent for the first 20,000 gallons of water after the minimum 5,000 will be made for the use of war gardens and irrigation of lawns for five months, beginning with May. To be entitled to this reduction, sign application blank in person at the water office. Be prepared to give area of garden tract and area of lawn, lot and block number. No reduction will be allowed unless application therefor is made, signed and has been approved. The usual 10 per cent additional reduction if paid before the 20th of the succeeding month. It is requested that at the end of the season applicants return to the water office their copy of application, stating in detail the amount and value of crops raised. 'A garden for every family' is the slogan."

STREET LIGHTING AND POWER

Commission Lacks Power to Raise Rates.

New York, N. Y.—Because of the belief that it lacks power to authorize an increase in the rates of a public service corporation above the maximum fixed by law, the state public service commission for the first district dismissed the application of the Bronx Gas and Electric Company for permission to raise its charge for gas from $1 to $1.50 per thousand cubic feet. Should the company appeal, efforts will be made to have the court of appeals pass upon the matter before the summer. The matter especially affects the gas companies in this city, because the maximum fixed by statute for gas, except in a few isolated instances, is 80 cents, a rate which every gas company has declared to be far below the actual cost of manufacture. The commission believes the companies should be permitted to charge a rate high enough to insure efficient service, and its opinion, prepared by commissioner Whitney, quotes from a decision of the appellate division, which said that "reasonable prosperity is necessary to reasonable service." In its application the Bronx company stated that the manufacture of gas now costs $1.14 a thousand cubic feet and that within a short time the cost will be $1.20. Similar figures have been submitted to the commission by some of the other companies. "If the commission is required and expected by the legislature," Mr. Whitney's opinion says, "to regulate all phases of the operation of a gas corporation such as this petitioner, dictate its service, compel its conformance to standards of quality, purity, and pressure of gas; prescribe its accounts, supervise its depreciation reserve, require the upkeep of property, and otherwise control the factors which determine its aggregate expenditures and influence largely its operations, is it to be expected that the legislature has left the commission powerless to secure to the company the reasonable revenues requisite for the fulfilment of the statutory purposes and the company's compliance with the regulatory orders? The presumptions would seem to be strongly against an intent to create any such one-sided plan of public regulation, a plan which commands the commission to require the companies to do various things to serve the public, yet withholds from the commission power to obtain for the companies the revenue necessary for the doing of those things." The commission refers to the enactment of the eighty-cent gas law in 1906, when normal conditions prevailed throughout the country and materials and the service of men could be obtained at a much lower cost than is now possible. It believes that the eighty-cent law, created after a long and fierce contest before the legislature, and another similar contest in the courts, was intended only to run as an experiment for an adequate number of years, and it says that this contention was upheld by the supreme court of the United States. Having enacted the law with much difficulty, the opinion says, it was considered as a measure of public policy, and that it was thought unwise therefore to place in the hands of the commission the power to overturn it. Attention is called to the recent opinion of Charles E. Hughes, who was governor when the public service commissions law was enacted, to the effect that the commission lacked power to increase a rate over the maximum fixed by the law. The charge of $1 made by the Bronx company was fixed by a special act, and the commission has reported that the company has conformed to the regulations of the commission and that on the whole its service has been "efficient and progressive." The opinion refers to recent decisions of the commission and of the courts dealing with the jurisdiction of the commission in the matter of rates of all utility companies. Section 66 of the public service commissions law, which relates to street railroads, provides that the commission may fix a rate, but the court of appeals recently decided that it did not have this power when a franchise or an agreement called for a fixed rate unless the local authorities first modified the arrangement. If the courts find that the commission has the same power to increase rates over the legal maximum as to lower them it is likely that all of the gas and electric companies in this city will file applications for relief.

Vote in Favor of Municipal Lighting Plant.

Redding, Cal.—Redding has voted almost three to one in favor of a municipally-owned lighting system. The vote for issuing $40,000 worth of bonds for that purpose was 744 in favor and 254 opposed at the recent election.

City Meets Company's New Rates with Old.

Marshalltown, Ia.—Notified that the Iowa Railway and Light Company intended to put in effect new and advanced rates for electric light and gas by May 1, the city council, at a called meeting, passed ordinances reestablishing the present rates for gas and electric current for lights, and added a penalty to each for violation. The ordinances are copies of the rate clauses of the original ordinances, the five-year periods during which those rates were effective having expired Sept. 1, 1917, and Jan. 1, 1918. The ordinance became effective April 14. The city now expects that the public utilities company will go into court in an effort to have the city enjoined from enforcing the ordinances. If that step is taken, as it probably will be, it will be the first move in what probably will be a lively legal contest over the rates for service. The penalty clause added to the ordinances provides for a fine of $100 for violation. The electric power ordinance rates run for twenty-five years from the date of the original ordinance, and are not affected by the present controversy. The new gas ordinance fixes the rates at $1 per 1,000 cubic feet, with the proviso that an additional 10 cents per 1,000 cubic feet may be charged customers who do not pay their bills within ten days after presentation. The electric ordinance for residences fixes 12 cents per kilowatt hour per fifty watt lamp for the first one-half kilowatt hour per month per lamp, and 7 cents per each kilowatt hour per month in excess of one-half kilowatt hour and up to one and one-half kilowatt hours per month per lamp, and 5 cents per kilowatt hour for all consumption in excess of one and one-half kilowatt hours per month per lamp. A discount of 10 per cent for payment within ten days of the date of rendering the bill is provided for. The rate for commercial lighting is the same with the exception that the 12 cents rate runs up to one kilowatt, and the 7 cents rate from one to three kilowatts and the 5 cents rate for all consumption in excess of three kilowatts per lamp per month. A discount of 10 per cent is provided for prompt payment, and for installation in excess of 25 lamps and consumption in excess of four kilowatts per month per lamp an additional 20 per cent discount is fixed. A list of questions prepared for the city and submitted to the Iowa Railway and Light Company at Cedar Rapids were not answered. These questions had to do with the price paid for the local plant, the price at which it was turned into the Iowa Railway and Light Company, and other interrogations bearing on the question of the amount of the investment in the local property. Vice-president John A. Reed replied that the city could ascertain the answers to these questions by an engineer's appraisal of the property. The city was then notified that the company would put new rates into effect with the issuance of the bills for the April accounts. To forestall this move the city council at once passed the ordinances re-establishing the old rates.

Indiana Commission on War-Time Utility Needs.

Indianapolis, Ind.—In its decision on the case of the Greencastle local Phoenix Telephone company, the state public service commission discussed its view of the need of the utility companies of the state in the following terms: "These are war times and the commission has time and again emphasized the proposition that it would not guarantee normal dividends to utilities during the period of the war. The utility must bear its share of the war's burdens, just as every other person and institution must bear its share. Even if it were necessary for the officers of the company to forego a portion of the usual salaries which they are receiving in order to pay a portion of the increased costs of operation, this would be a much more equitable solution of the problem than an increase in the rates. The commission is not unheedful of the fact that much has been said recently as to the necessity of carrying our public utilities through the war period. The commission is keenly alive to the point thus emphasized by secretary McAdoo, and has laid down the fundamental proposition that it will grant a full measure of relief whenever necessary to prevent injury to the business or interests of utilities. But certainly the statements above quoted are not to be interpreted as meaning that state and local authorities should, during the period of the war, guarantee to utilities the full or excessive profits of peace times. In several cases before the commission it has developed that utilities have built large and valuable properties out of earnings and that the profits in the years preceding the war were in excess of what would have been considered reasonable profits under the regulatory system. Now when war conditions have arisen and the large profits of the past have decreased, the utility will feel that it has just grounds for asking increased revenue. The commission, of course, cannot concur in such a conclusion."

FIRE AND POLICE

Big Fire in Oil Plant.

Cambridge, Mass.—With hard work and unhampered by a wind the Cambridge fire department stopped the spread of a blaze that caused damage of probably $100,000 in the oil storage plant of the Alden Speare's Sons Company. The firemen carried the fight into the heart of the blaze, with barrels of oil flaming on all sides. A general alarm was given, and within an hour the fire was subdued. The fire began in a backfire in an automobile truck that carried a large tank of road oil and which was about to start from the company's yard. The oil-soaked body of the machine caught and in an instant the contents of the tank were ablaze. The driveway on which the burning auto stood is flanked by storage buildings, and adjoining this is a yard where hundreds of barrels of oil lay on the ground. Each building was also filled with oil in barrels. At the farther side of the shed a railroad tank car filled with oil was standing on the Grand Trunk tracks. Farther back in the yard are two tanks, each of which contains 30,000 gallons of oil. By hard work the firemen kept the flames from these and also from the tank car. The heat from the burning automobile communicated to the buildings at either side and also to some of the barrels on the ground, and the flames spread rapidly. Two heavy explosions signalled the start of the blaze, and from that time on there were innumerable slight explosions as the barrels blazed up. The fire started just after twelve o'clock, when practically all of the employees were at dinner. When the first apparatus arrived a column of smoke and flame was twisting high in the air. So intense was the heat that sheets of the corrugated iron were melted away. The firemen were fortunate in that the blast from the burning oil carried the smoke skyward, and thus they were not hampered. The firemen attacked the blaze on both flanks, as well as from the front. The plant of the Galena-Signal Oil Company, a subsidiary of the Speare company, adjoins the section where the fire was at its worst, but was saved. In the immediate vicinity are the gasoline and road oil storage plants of a number of companies. On the way to the fire engine 7, a motor-driven piece of apparatus, collided with the horse-drawn hose cart of engine 4. The engine was towed back to quarters. No one was injured.

Federal Government "Controls" Philadelphia Police.

Philadelphia, Pa.—The United States has taken over the active direction of the entire police force of Philadelphia. Captain William B. Mills, head of the traffic squad, is now in control of the police, and is responsible only to Lieutenant-Colonel Charles B. Hatch, who represents the Navy Department. Superintendent of police James Robinson was slated by the mayor for a vacation, "which will last as long as he wants." These announcements followed a series of stormy conferences between Lieutenant-Colonel Hatch and mayor Thomas B. Smith. These developments marked the end of the week in which Secretary Daniels gave Philadelphia to wipe out vice resorts on penalty of establishing federal vice zones, which virtually would sweep out the saloons of the city. Captain Mills will be known officially as assistant superintendent of police, but he will be permitted to issue and sign orders unhampered by William H. Wilson, director of public safety, or by mayor Smith himself. He is responsible only to the federal representatives of Lieutenant-Colonel Hatch. In a statement Lieutenant-Colonel Hatch refused to say that the government had "commandeered" the police force in the full meaning of that word. He added, however, that the government was determined to clean up the city if the police could not do so. He said that, in addition to the police changes effected, sixteen enlisted men would continue to operate with six secret service men in checking up vice conditions here. He said: "Captain Mills had military training, and I believe he will clean up the city. Mayor Smith gave me his word of honor that Captain Mills will be unfettered and that he can promote and demote men as he sees fit. I told Captain Mills he is acting for the government and that I will back him up in everything he does so long as he is not fettered. Captain Mills told me that forty-eight hours after he takes control he would show that he is in absolute charge of the police department. I am acting for Secretary Daniels, and he has no desire to take control of the police here out of the hands of the municipal authorities. We intend to see, however, that the young men in the service are protected and that evil resorts are wiped out. I believe that conditions at present are good, and all we want to see is that they remain good. Our investigators will keep in constant touch with the situation, and our reports will go to Washington." Lieutenant-Colonel Hatch unequivocally rejected the proposal made by mayor Smith and director Wilson that the authority in the police force be divided between Mills and Robinson. He asserted that the federal government was dissatisfied with the attempts which superintendent Robinson had made to suppress vice, and that the one man in Philadelphia who was acceptable to the government was the head of the traffic squad. Mayor Smith said: "I am glad that we are out of this vice crusade. The government has commandeered the entire police force of Philadelphia, and since the government has taken that step I bow to the United States government." Captain Mills said, however: "There is no truth in the statement that the United States government has commandeered the bureau of police. There is a perfect understanding between director Wilson and myself, and I have been given by him full power and control over the entire bureau, and I am answerable to him for every official act." A special fight will be waged against politics in the force, and a beginning was apparently made when the mayor reorganized the police trial board, dividing appointments equally between the two political factions. There were also a number of shifts in assignments.

Within a day after Mills took charge hundreds of habitues of the tenderloin district had left the city. Acting under the first orders of Captain Mills the captains and lieutenants were told they would be held to strict accountability for their divisions and districts, and they shut down the lid at once. Freed from political influence and given a free hand for the first time in years the captains and lieutenants knew exactly what to do. They went to their station houses and consulted the list of suspected places on file and compared them with supplementary lists. Then orders were issued to the policemen on the various routes to notify the suspected places they must close. At a conference with the officers Captain Mills said: "Discipline of the kind I demand can be obtained only by a complete severance of all fetters on the police, either political or personal. Get out of politics, pay no political assessments, forget your friends who want political favors and do only police work if you wish to hold your jobs. This is my first order and it will not be repeated. To emphasize my position let me say to you that in the future the recommendation of a politician will be a handicap rather than an aid to any policeman either seeking promotion or who is in trouble as a result of violation of orders. Responsibility for police work will reach from the patrolman on the beat all the way up the line. Remember, orders will be issued once; there will be no reminders. I have placed the responsibility for the conduct of the forty-two police districts upon the lieutenants. For the five police divisions the captains will be held responsible." The latest statement of mayor Smith was: "I have every hope he will make good, and the arrest of those who persist in running gambling houses and other illicit places will come as a matter of course. The time has passed when a gambler or protected vice of any sort is an asset to a political organization. Rather, indeed, are they poor liabilities."

Firemen Ask for Minimum Wages at Referendum.

San Jose, Cal.—The firemen have succeeded in obtaining more than the necessary number of signatures to their petition asking for a vote on May 6 on the proposition to have their pay increased from $80 to $100. They advertised their case in the local newspapers as follows:

VOTERS OF SAN JOSE, DID YOU KNOW THAT
SOME SAN JOSE FIREMEN

Receive less than 89 cents for eight hours' work, or only $80 per month?

That they work 24 hours a day?

That they are away from their wives and families 313 nights each year?

That they cannot go over 100 feet from the fire house at any time only when off duty one day a week?

That they must answer every down-town alarm whether on duty or off duty?

That they spend nearly half of their meal hour (just granted by the State) going to and from their meals?

That they cannot go to the doctor or dentist unless they lose six hours' pay?

That they cannot go to church on Sunday or any other time.

That they are denied the companionship of their family and the comforts of a home?

That their entire life is one of loneliness equal to imprisonment?

Under these conditions will you give them a living wage?

Thirty-six Die in Institution Fire.

Norman, Okla.—Feeble-minded and demented boys numbering thirty-six lost their lives in a fire which destroyed three ward buildings of the state asylum here. Unconscious of any danger the boys stared blankly from their cots at the smoke and flames that were quickly enveloping their ward, and the pitiful pleadings of workers at the institution who fought the flames could not make the inmates realize what was happening. Rescuers were forced to drag or carry to safety those that were taken from the building alive, 125 being carried to safety. Dr. B. W. Griffin, superintendent of the institution, was one of the first on the scene following the sound of the alarm. He, with the aid of asylum employees and interns, bravely risked their lives to save the boys. A strong early morning wind fanned the blaze, which originated in the linen room from an unknown cause. The boys' ward was adjoining, and the flames enveloped the building so quickly that the structure collapsed before the rescuers had time to carry many to safety. Several of the workers were overcome by smoke and slightly injured by falling timber. It was not long before the building collapsed. The buildings destroyed were frame structures.

GOVERNMENT AND FINANCE

Indebtedness of California Cities.

Sacramento, Cal.—According to John S. Chambers, state controller, the total bonded indebtedness of the state government of California and the cities of the state for the fiscal year ending last June, and which will be shown when his annual report is printed and distributed, is $237,948,463.51. The interest paid in 1917 was $11,315,452.02. The bonded indebtedness of the cities as now outstanding is $139,451,711.68; of the counties, $64,003,251.83, and of the city government, $34,493,500. In addition the state has on hand bonds unsold in the sum of $28,875,000. During 1917 the cities voted down bond issues in the sum of $4,858,500 as against rejections in 1916 totaling $12,679,500. The bonded indebtedness of the cities increased in 1917 $11,539,520.05 as against an increase in 1916 of $16,466,728. Controller Chambers, in his report, as in previous reports, has urged the necessity of short-term, low-rate serial bond issues as against the long-term, high-rate bond issues of the past. He asserts that the people of California have gone "bond crazy," and declares that future issues should be held to matters of the first importance, which would impose too heavy a present burden if undertaken by direct taxation.

City Need Not Pay Taxes on Abandoned Dam.

New York, N. Y.—By the report of referee J. W. Boothby, New York city wins a ten years' court fight with the assessors who tried to tax an abandoned dam under thirty-six feet of water in Croton Lake and raised the question as to when a dam is not a dam. The dam was constructed eleven years ago. The report favors exempting the old dam from local taxation and reduces the assessment on flooded land, the total saving to the city amounting to $75,000.

City Officials Must Give Information Free to State.

Harrisburg, Pa.—City and borough officials are required to furnish any information asked of them in accordance with the law creating the bureau of municipalities of the department of labor and industry, and for such services they are entitled to no pay, is the decision of deputy attorney general Emerson Collins in reply to a question raised by Lew R. Palmer, acting commissioner of labor and industry. To comply with the law the information must be requested by the chief of the bureau who is J. Herman Knisely. The opinion is the result of certain city officials declining to furnish data to the state without being paid for their services, and the effect will be to place promptly in the hands of the bureau of municipalities, formerly the bureau of statistics and information, the required data. The opinion distinctly limits the law to cities, but while country or township officers are not compelled to give information on request without extra pay, Mr. Collins says that "it will no doubt be found in the public interest these latter officials will furnish the bureau with any desired information without charge. After quoting the provisions of the law, Mr. Collins says: "The conclusion is clear that the duty rests on city and borough officials throughout the commonwealth to furnish any information that may be required of them under and in accordance with the provisions of the said act, and that since the act makes no provision for compensation—they are entitled to none."

TRAFFIC AND TRANSPORTATION

Commission Asserts Power to Regulate Fares.

Kansas City, Mo.—The state public service commission at Jefferson city has handed down an informal decision in which it asserts that it had jurisdiction to regulate the rate of fare for street railway service. The decision followed a hearing at which briefs were submitted by the Kansas City Railways and the city. The city claimed that the franchise of the railway explicitly provided for five-cent fares, and that the city alone had power to change this provision. Many citations were made by the railway to show that the public service commission, even without the authority explicitly given by the act creating it, would have power to regulate rates as against the authority of a city which granted a franchise to the railway. The ruling of the commission grew out of the request of the Kansas City Railways to the public service commission of Kansas for increased fares. The company has a franchise in Kansas City, Kan., with seven years to run. It is probable that one or more joint meetings may be held by the two state commissions, during the progress of their consideration of the petitions now before them.

Voters Disapprove Municipal Railway Ownership.

Tacoma, Wash.—At the recent primaries the voters considered a referendum on the proposal to issue bonds for the purchase of the street railways owned by the Tacoma Railway & Power Company. The plan was voted down, four to one. The bond issue was to have been for $5,200,000.

Cleveland's Transit Commission Held Legal.

Cleveland, O.—The state supreme court has handed down a decision in which it upholds the legality of the ordinance providing for the appointment of a rapid transit commission and the construction of a subway in this city. The commission proceeded to request a bond issue of $100,000 to provide funds for preliminary investigations and engineering work. The members of the commission are Charles A. Otis, M. A. Bradley, C. E. Adams, street railway commissioner Fielder Sanders and finance director Neal.

Vote Funds for Municipal Railway Construction.

Seattle, Wash.—At the recent city election the transfer of bonds amounting to $350,000 from an original bond issue of $800,000, for the construction of a double-track municipally owned and operated elevated railway on certain streets was approved by the voters. The line is expected to provide at least a partial solution of the congestion problem in the industrial district and give increased transportation for shipyard workers. Work will progress immediately, and it is expected that the line will be completed within less than six months. Of the $800,000 bond issue authorized for the construction of the Seattle municipal street railways, $425,000 has been used to date.

All Forces Unite on Pittsburgh Valuation.

Pittsburgh, Pa.—A commission consisting of five engineers, one representing the city of Pittsburgh, one representing the boroughs surrounding the city, two representing the Pittsburgh railways, and the fifth, the chairman, representing the state public service commission, has been appointed to direct a valuation of the property of the Pittsburgh railways. This follows the decision of the commission in connection with the case against the railway growing out of the new fares put into effect in January. The members of the commission are as follows: F. Herbert Snow, chairman, chief engineer of the public service commission; Robert M. Feustel, member of the firm of Sloan, Huddle, Feustel & Freeman, consulting engineers of Chicago and Boston, representing the city of Pittsburgh; George Warren Fuller, New York, member of the firm of Fuller & McClintock, representing the boroughs; Morris Knowles, Pittsburgh, chief engineer in charge of housing for the United States shipping board, under whose direction the filtration plant at Aspinwall was built, representing Pittsburgh railways; J. A. Emery, New York, appraisal manager of Ford, Bacon & Davis, representing the Pittsburgh railways. It is understood that the members of the commission will confer regularly on two days of each week.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

County Highway—Dedication.

Washington.—If dedicatory grants to county of highway, embodied in papers filed by landowners in statutory proceding to open highways, contained particular descriptions of land for road, nothing more was necessary to complete dedication than acceptance by county authorities or public, regardless of whether there was formal statutory establishing of roads.—Horton v. Okanogan County, 168 P. 479.

Water Supply Outside City—Discontinuation—Estoppel.

(Ga.) Where city engages ultra vires in supplying water to customers beyond its limits their improvement of their property in expectation of water main did not estop city from discontinuing service and removing water pipes.—City of Gainesville v. Dunlap, 94 S. E. 247.

Public Street—Recognized Private Claims—Estoppel.

(Utah) City held estopped from claiming as public street premises lying without 66-foot width of street, as shown on map filed with city council for approval by claimants of property, plaintiff's predecessors, city attorney and council having approved claimant's title, and city having possessed land for taxes.—Wall v. Salt Lake City, 168 P. 766.

Highway Improvement—Assessment Methods.

(Wash.) Highway Law (Rem. Code 1915, §5879—10), providing for assessment of land for highway improvement by a combination of the zone and area methods of assessment, is not arbitrary or made upon a fundamentally wrong basis.—Lindstrom v. McMillan, 168 P. 463.

Change of Highway Grade—Right of Way—Damages.

(Tenn.) Where plaintiff with others had obtained a prescriptive right of way across land to a public highway and there was no other egress to the public road, she was entitled to damages from the county for an obstruction of such road by the lowering of the grade of the main road.—Morgan County v. Goans, 198 S. W. 69.

Paving Blocks—Sale—Count—Indemnity.

(N. H.) Where the seller delivered paving blocks, stating the quantity, and the purchaser did not count them, but returned the bond, indemnifying it against breach of the contract, the obligor was not thereafter liable when the seller's count was found to be incorrect; the bond not being to secure accuracy of count.—Winslow v. Anderson, 102 A. 310.

(N. H.) The obligator on a bond indemnifying purchaser of paving blocks against breach of the contract is not liable thereon on mere showing of shortage in the number of blocks without evidence of damage.—Winslow v. Anderson, 102 A. 310.

Occupation Tax Prohibitive—Detrimental Occupations.

(N. M.) The ordinary useful occupations may be taxed, but the tax must be so laid as not to be prohibitive of the business, which rule does not apply to occupations detrimental to public welfare, but nevertheless tolerated.—Stalick v. Town of Gallup, 168 P. 707.

Ordinance—Failure to State Emergency.

(Tex. Civ. App.) San Antonio ordinance of August 27, 1917, regulating automobiles used for hire, is not invalid for failure to state, either in preamble or body, the existence of an emergency.—Craddock v. City of San Antonio, 198 S. W. 634.

(Tex. Civ. App.) The requirement that the title of an act shall embrace its subject does not apply to municipal ordinances.—Craddock v. City of San Antonio, 198 S. W. 634.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

April 26, 27.—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, University of Pennsylvania, Philadelphia.

May 7-9.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 7-10.—CANADIAN GOOD ROADS ASSOCIATION. Annual road congress. Secretary, George A. McNamee, 909 New Birks Bldg., Montreal, Que.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 14.—AMERICAN ASSOCIATION OF ENGINEERS. Fourth annual convention, Chicago, Ill. Secretary, A. H. Krom, 29 South LaSalle St., Chicago.

May 15, 16.—SOUTH DAKOTA ELECTRIC POWER ASSOCIATION. Annual convention, Carpenter Hotel, Sioux Falls.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Goss, 315 Plymouth Court, Chicago, Ill.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, Roanoke, Va.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

Northwestern Society of Highway Engineers.

Harmonization of the road laws and policies of Washington, Oregon, Idaho and Montana for better results and raising of the standard of highway engineering were among the principal subjects discussed by the delegates attending the meeting of the Northwestern Society of Highway Engineers, which held a two-day session—April 12 and 13—in Seattle.

Oregon engineers organized the society on April 9, 1917, at Portland, and this was their annual convention. It was primarily a "get-acquainted" meeting of the highway builders.

At present the organization has 136 members — eight from Washington state, two from Idaho and five from Montana. The other 121 members are from Oregon.

State highway commissioner James Allen told of obstacles met and overcome in this state by his department. He stated, among other things, that the state of Washington has at present 3,200 miles of roads, one-half of which are improved.

Commissioner Allen was followed by councilman R. H. Thompson, prominent in Northwest engineering circles, who suggested the naming of a committee by the association, to be vested with the power of disbarring members who did not honorably practice their profession.

Engineer C. B. McCullough, professor of civil engineering, Oregon State Agricultural College, in the King County commissioner's quarters, gave a lecture on bridge construction, illustrating on a screen the principles of construction of the large bridges in Oregon. Saturday night a banquet was held at the Seattle Hotel, and a trip to Camp Lewis was enjoyed by the visiting engineers the next day.

American Institute of Electrical Engineers.

The local sections of the American Institute of Electrical Engineers discussed a number of interesting papers during this month: "Electrification of Railroads in Its Relation to Communication Lines," by H. S. Warren, before the Philadelphia section, April 8; A. E. Bauhan, station superintendent Pennsylvania Water Power Company, on "Power-Station Operation and Maintenance," before the Baltimore section, April 12. At Pittsfield, Mass., A. C. Crehore, "Modern Consumption of Matter and Energy," April 11; Ann Arbor, Mich., Professor J. C. Parker, "Hunting," April 12; Boston, Stephen Hayes of the Westinghouse Electric & Manufacturing Company, "European Electrical Business in War Times"; Los Angeles, J. C. Ward, superintendent of generation of the Southern California Edison Company, "Fuel Oil Conservation," April 9; Toronto, Paul Ackerman, "High-Tension Insulators from the Operating Viewpoint," April 19.

North Carolina Health Officers' Association.

The North Carolina Health Officers' Association recently held its eighth annual meeting at Pinehurst. A feature of the session was a visit to the State Sanatorium for Tuberculosis, the members going through the country in automobiles, as guests of Pinehurst and Southern Pines. Following the reports of the various county health officers the sanatorium was inspected under the guidance of the superintendent, Dr. L. B. McBrayer.

Two things were particularly emphasized in the papers presented and the discussions. These were the imperative need of educational work along health lines and the problems that are accentuated by the war. The retiring president, Dr. D. C. Absher, presided, clad in olive drab, he being in active service as a lieutenant in the Medical Reserve Corps. There were several others in uniform present.

Following the annual address of the president and the report of the secretary and treasurer papers were presented by Dr. Miller, of the United

(*Continued on page 358*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

West Park, O., is constructing SEWERS. E. H. Arnold prepared plans and specifications for the work.

Kenilworth, N. J., is considering the installation of a new SEWAGE TREATMENT PLANT. N. M. Looney is the engineer for the proposed work.

Paulsboro, N. J., is to contruct a SEWAGE DISPOSAL SYSTEM after the preparation of plans by the consulting engineering firm of Remington & Vosbury.

Jacksonville, Fla., is to contruct a BRIDGE at a cost of $950,000. Preliminary plans for the structure are in course of preparation by the engineering firm of Harrington, Howard & Ash.

Santa Barbara, Cal., is receiving bids for the construction of a DAM. Plans and specifications for the structure were prepared by the consulting engineering firm of Quinton, Code & Hill.

Oskaloosa, Ia., is to vote on a proposition to issue $400,000 bonds for WATERWORKS. The consulting engineering firm of Burns & McDonnell has prepared plans for the plant.

Northampton, Pa., is to make STREET IMPROVEMENTS according to plans prepared by the engineer, L. J. H. Grossert.

Burford, Ont., is to contruct two reinforced concrete BRIDGES. The engineers for the work are the firm of Jackson & Lee.

A new FILTRATION PLANT is to be built by Auburn, N. Y. The consulting engineers for the improvement are the firm of Hazen, Whipple & Feller.

York and Cumberland counties, Pa., are to build an inter-county BRIDGE according to plans being drawn by the engineer, Charles A. Williams.

A reinforced concrete ROAD is to be built by Butler County, Butler, Pa. Plans and specifications for the work were prepared by the Farris Engineering Company.

New Toronto, Ont., is to build a FILTRATION PLANT to cost about $40,000. The engineering firm of James, Loudon & Herzberg is responsible for the plans and specifications for the work.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A $1 extra.

Du Pont Photograph Contest.—To increase the interest in Du Pont products and to secure suitable photographs to illustrate the advertising and publicity of their various companies the Du Pont American Industries offer $500 in prizes for the fifty best photographs. The prizes are as follows: First prize, $100; second prize, $50; two third prizes, $25 each; fourteen fourth prizes, $10 each; thirty-two fifth prizes, $5 each. The photographs have to illustrate the following subjects, and be submitted before September 1, 1918: Agricultural Uses of Explosives; Fabrikoid (Artificial Leather); Industrial Uses of Explosives; Painting; Trapshooting and Hunting; Miscellaneous. Further details and entry blanks may be obtained from the "Advertising Division, E. I. du Pont de Nemours & Co., Wilmington, Delaware."

The American-La France Fire Engine Co., Elmira, N. Y., has recently made the following shipments: Toms River, N. J., type B hose car; Port Chester, Pa., type 12 combination chemical engine and hose car; Providence, R. I., two type 45 triple combinations; Lincoln, Ill., Brockway combination; Nahant, Mass., type 12 triple; Otisville, N. Y., type 10 combination chemical engine and hose car; Kellog, Idaho, type 40 combination chemical engine and hose car; Elmwood, Ind., type A hose car; Etna, Pa., two type B combinations; Corvallis, Ore., type 45 triple; Marion, Ind., type 12 pumping engine; York, Pa., type 45 combination chemical engine and hose car; Portland, Ore., type 45 combination; Greenwich, Conn., type 12 triple; Naugatuck, Conn., type 12 triple; York, Pa., type 45 combination; Butte, Mont., type 40 chemical engine; Appleton, Wis., type 12 combination; Bellair, Pa., type 12 triple.

"History's Lesson to the Motor Truck" is the subject of a new booklet, issued for general distribution, by P. W. Litchfield, vice-president and factory manager of the **Goodyear Tire & Rubber Company** of Akron, Ohio. This booklet is an important and interesting addition to motor truck trade literature. Mr. Litchfield has grasped the real significance of the motor truck's mission as an agent of transportation, and visualized a new era in transportation with fleets of motor trucks plying long distances, operating day and night on a regular schedule.

The present line of motor trucks which the Goodyear Tire & Rubber Company is operating between its factories at Akron, Ohio, and Boston, Mass., covering a round trip of more than 1,500 miles, is the product of his thought and perseverance. Nearly a year before the railroads became so congested with traffic as to jeopardize the efficiency of war preparations he foresaw the coming trouble and advocated a wider use of motor trucks in inter-city transportation.

The booklet, just issued, opens with a review of the progressive stages that transportation has passed through, from the camel to the latest forms of motorized vehicles. The change from wind and animal power to steam power is shown to have ushered in the modern era, and the inventions of the internal combustion engine and the pneumatic tire are credited with the wonderful revolution that motor transportation is inaugurating in the traffic world today. The trend of motor truck tire equipment is shown to be in the direction of pneumatic tires, which allow lighter chasses and bodies than those designed for use on solid tires, and allow heavier loads with no increased burden on the truck.

Pipe in Unusual Services.—A very interesting and well prepared booklet, containing photographs which should prove of interest to all users of pipe, has just been issued for free distribution by the **Central Foundry Company**, 90 West Street, New York, N. Y. The booklet especially features severe or unusual conditions under which Universal pipe has been laid. One illustration shows the pipe installed under flood conditions at Key West, Fla.; Universal pipe under 120 and 130 pounds pressure; Universal pipe laid on a dam which was afterwards washed away, leaving 72 feet of pipe suspended, but intact in every joint. A useful feature of the booklet consists of directions for laying Universal pipe.

PERSONALS

Dalzell, A. G., Asso. Mem. Can. Soc. C. E., and member of the Royal Sanitary Institute, has resigned his position of assistant city engineer of Vancouver, B. C. During the two years he held this position he designed and superintended the construction of 145 miles of sewers at a cost of $3,900,000.

Hanreddy, Joseph, well-known Chicago contractor, died at his home there on April 9. He was born in that city in April, 1864. His earlier work in the contracting business was confined usually to paving, but later he undertook larger jobs. Among the more important works carried out by him were the Lawrence Avenue intercepting sewer and part of the Southwest water tunnel under the city at Chicago; the Linnwood Avenue intake tunnel under the lake at Milwaukee, Wis., and the Lake Union tunnel at Seattle, Wash.

Whittington, W. W., mayor of Alexandria, La., died recently from peritonitis following an operation. He was serving a second term as mayor, having been first elected five years ago, when the commission form of government was adopted. Mr. Whittington was a native of Alexandria, 43 years old. He received his education in the city schools and at Tulane University in New Orleans. He was very successful in his business. In addition to his official duties he was interested in banking and several lumber enterprises, besides owning considerable real estate.

NEWS OF THE SOCIETIES

(*Continued on page* 357)

States public health service, stationed in Edgecombe County, on developing county health work, and by Dr. S. A. Stevens of Monroe, Dr. Ben K. Hayes of Oxford and Dr. Z. M. Caveness of Raleigh.

Highway Traffic Association of New York.

A public meeting of the Highway Traffic Association of the State of New York will be held in the grill room of the Automobile Club of America, 247 West 54th street, New York City, at 8:30 p. m. on Friday, May 10, 1918.

Dr. John A. Harries, special deputy commissioner in charge of traffic, police department of the city of New York, will speak on the topic "Traffic Problems of the City of New York." The address will be followed by a general discussion.

Dinner, at $1.25 per cover, will be served in the grill room at 7 p. m. Any one wishing to attend the dinner should notify the secretary, Elmer Thompson, 247 West 54th street, New York City.

South Dakota Electric Power Association.

It has been decided to hold the annual convention of the South Dakota Electric Power Association on May 15 and 16. The meeting place will be the Carpenter Hotel, Sioux Falls.

Nebraska Association of Civil Engineers.

At a special meeting held by the members of the Nebraska Association of Civil Engineers, held recently in the Paxton Hotel in Omaha, in the interest of improved road conditions, T. H. McDonald, state engineer of Iowa, spoke of plans concerning the proper construction of good roads.

More than fifty members of the association attended the meeting, which was preceded by a banquet.

Mr. McDonald said: "State taxes on the valuation of farm property has never paid for the construction of maintenance of roads, as is shown by annual reports. Funds for the building of state roads have been created in cities, town corporations or from the taxes levied on automobiles."

George L. Campen is president of the Nebraska Association of Civil Engineers; Homer B. Kanouse is secretary.

Municipal Journal

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WATER WORKS OPERATION

Introduction to a Series of Articles to Appear in Municipal Journal Dealing with Details of Maintenance and Operation Methods, Physical and Commercial, Field and Office.

Technical periodicals contain from week to week numerous articles describing the designing and constructing of water works systems and discussing the principles involved therein; but the articles dealing with details of the operation of such systems are very much less in number. And yet, while the construction occupies but a few months or years, the operation goes on indefinitely; and it is an oft-repeated statement that the success, effectiveness and efficiency of almost any public utility depends as much if not more upon the operating of it than it does upon its manner of construction. Moreover, the designing and constructing are generally performed by engineers and contractors who have made a specialty of this line of work and are presumably well-informed as to how it is best to perform it; while the operation is frequently undertaken by men who have had little or no experience in this line of business and must learn all of its details from personal experience or by information obtained elsewhere.

For this reason, it would appear to be desirable that information concerning the operation and maintenance of the various features of water works plants should be given a much more prominent place in technical literature. Accordingly we are expecting to publish during the next few months a series of articles dealing with this subject, in which we shall endeavor to summarize the information obtainable from various sources, including our own experience. It is hoped that these articles will serve as a stimulus to water works superintendents to contribute more generously suggestions derived from their own experience; and we urge all who have any new or valuable ideas to offer to send them for publication in the columns of Municipal Journal.

There is a very wide variety of features that go to make up water works systems in various sections of the country, and in making any comprehensive review of the subject of operating and maintaining water works, this diversity suggests the desirability of a classification of the discussion, since suggestions applicable to one plant may be of no pertinence whatever to another.

The physical features of a water works may be broadly divided into those of head works, which would include intakes, storage reservoirs, wells, etc., and pumping plants; treatment plants; regulating works, comprising chiefly distribution reservoirs and stand pipes; and the distribution system proper.

Each of these will have a greater or less number of subdivisions. For example, the intake may be located on a small stream, in a large river, or far from shore in a large lake. The wells may be shallow dug ones or tube wells several hundred feet deep. Pumping plants may be operated by steam, internal combustion engines, electricity or water power. The treatment plant may consist of a simple liquid chlorine plant which is almost automatic in action, or may be an elaborate combination of sedimentation tanks, softening apparatus, sand filters, and chlorinating apparatus requiring expert attendance.

Under the head of distribution system, we have to consider the several kinds of pipe used (this is of special interest at this time, when the cost of cast iron has increased to such excessive amounts); but the greatest amount of information probably will have to do with minor details of every day practice, such as excavating and backfilling, tapping pipes for corporation cocks, inserting large branches in mains under pressure, the various kinds of service pipe that have been used and the effect of various characters of water and soil upon them, the use and location of meters, thawing and other maintenance operations involved in the care of fire hydrants, and a score of other items of detail.

In addition to these physical features of operation, we have the business features which to many superintendents are even more vexing and perplexing. These include, among other things, the fixing of rates which will be adequate to secure a proper income without involving either loss or undue profit and which shall apportion the cost of maintenance in a fair manner between the small consumer and the large. We have in addition the details of office practice, such as keeping records of the physical features of the plant; the keeping of the accounts of consumers and making out and delivering bills; the keeping of records of individual meters and the testing of meters to determine their accuracy and reliability from time to time; the soliciting of new business; and in general, the maintaining of a cordial feeling between the public and water department or company.

There must always be borne in mind certain of the larger features of maintenance which need definite action only occasionally, but which action cannot, without serious detriment to the plant, be postponed beyond a certain period. We refer to the maintaining of the pumping plant adequate to the growing needs of the service, the securing of additional capacity before the existing plant has so nearly reached its limit that an emergency demand may find it lacking; the reinforcing of the distribution system by larger or additional feeder mains in order to insure adequate quantity and pressure of supply at all parts of the city; the inauguration of treatment of the water that may be called for more and more urgently by increasing danger of pollution; and various other changes or augmentations in the main features of the plant that are made desirable from time to time by the growth of the service or by other conditions that change but slowly but which demand that the plant be adapted to them.

Of all of the physical features of water works plants, the distribution system is apparently the only one that is common to all plants, and we purpose to begin with the consideration of this in the series of articles herein referred to. As the first installment, we present this week a tabular summary of the practice of several hundred cities relative to the use of mechanical appliances, thawing frozen pipes and hydrants, and routine valve inspection.

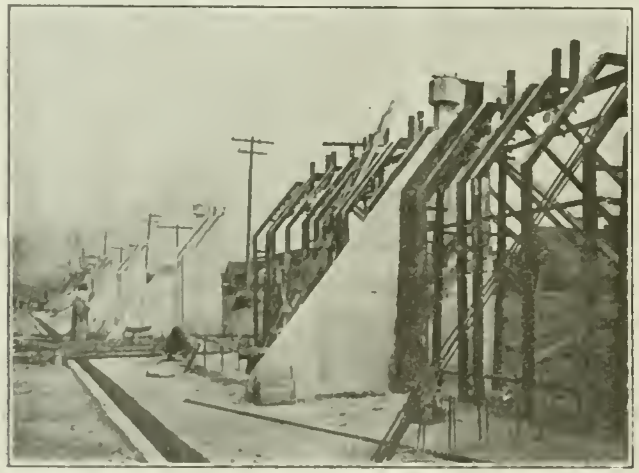
HIGHLAND PARK RESERVOIR

An Unusually Large Reinforced Concrete Reservoir, Consisting of a Thin Wall Supported by Numerous Buttresses—Forty-five Million Gallons Capacity—Appliances Used in the Construction.

A reinforced concrete reservoir 1,373 feet long, 294 feet wide and 14 feet deep, with a capacity of 45,000,000 gallons, has just been completed at Highland Park, Michigan, a suburb of Detroit, at a cost of $295,000. This is a part of a new plant demanded by the rapid growth of the community, another feature of which will be a rapid sand filtration plant with a capacity of ten million gallons a day and estimated to cost $300,000.

Water is obtained at Lake St. Clair, eleven miles distant, where is located an intake crib and pumping station. From here water is pumped to the reservoir, which it enters at the south end through a gate chamber, through which also passes the outlet pipes. Gates in this chamber are so arranged that in an emergency, or when cleaning the reservoir, water can pass from the inlet to the outlet pipes without entering the reservoir. The water passes the gate chamber through a system of pipes that discharge it at different points throughout the area of the reservoir so as to secure circulation. A 54-inch concrete pipe down the center of the reservoir, provided with laterals, serves this purpose.

For draining and flushing out the reservoir, there are four gutters running lengthwise of the reservoir and four branching from them crosswise of it. Eight 6-inch force mains enter the reservoir, provided with risers through the floor near the cross drains, arranged for attaching hose to them, to be used in washing off the floor.



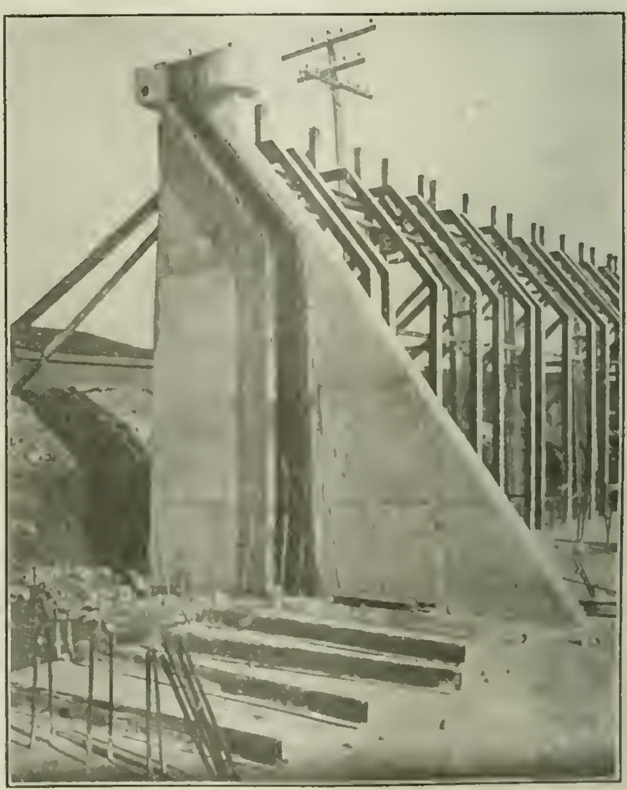
STEEL FRAME FOR OUTSIDE FORM OF CURTAIN WALL.
Six completed expansion-joint buttresses in the background. Reinforcement for intermediate buttress in foreground.

Excavation for the reservoir was performed with three steam shovels and about 70,000 cubic yards of earth was removed, which was readily disposed of in the vicinity. The excavating cost 26 cents a cubic yard, which was below the estimate.

The concrete floor was placed by F. C. Austin Co. paving mixers that spouted it for a radius of 25 feet from the mixer. Steel pavement forms were used and the floor was placed in 50-foot strips. As a part of the floor there were constructed wall footings, in which were set stub reinforcing bars to which were connected later the reinforcement of the wall and its buttresses.

The wall was strengthened by buttresses at short intervals extending into the reservoir and well reinforced, the reinforcing bars being tied to the stubs just mentioned. The forms consisted of steel beams and plates, as shown in the illustrations. These were obtained from the Hydraulic Pressed Steel Company. Each 52 feet there was a buttress, in each face of which was a groove that served as an expansion joint, this groove being lined with asphalt-saturated felt before the wall was cast against it. These expansion-joint buttresses were cast first; following which the wall and the intermediate buttresses were cast as a monolith, two 52-foot sections and two expansion-joint buttresses being poured in a day, after the forms were erected.

For making and placing the wall concrete, there were used a mixer and inclined elevator, the whole traveling on wheels along and close to the wall. The mixers (built by the Jaeger Machine Company) delivered the concrete into skip cars. These were lifted up along an inclined track carried by a trestle, to an elevation considerably higher than the top of the wall, where the cars dumped the concrete into a chute that discharged it into the forms. The concrete aggregate was brought to the mixer in trains of side-dump cars traveling on contractor's track laid on the reservoir bottom. The several illustrations give an excellent idea of the general appearance of the reservoir and of the construction methods.



EXPANSION JOINT IN BUTTRESS.
These joints were placed at intervals of 52 feet along the wall. The grooves were lined with asphalt felt. On top of each expansion-joint buttress was placed a light standard, the base for which is seen at the top of the buttress. Other buttresses, monolithic with the wall, were placed at intervals of 13 feet. All buttresses were tied to the concrete bottom of the reservoir by means of reinforcing bars, those for one buttress being seen in the foreground.

AFTER-THE-WAR PRICES ON WATER WORKS CONSTRUCTION.*

Cost of Labor and Material May Go Higher—Will Not Fall to Former Rates for a Number of Years, if Ever.

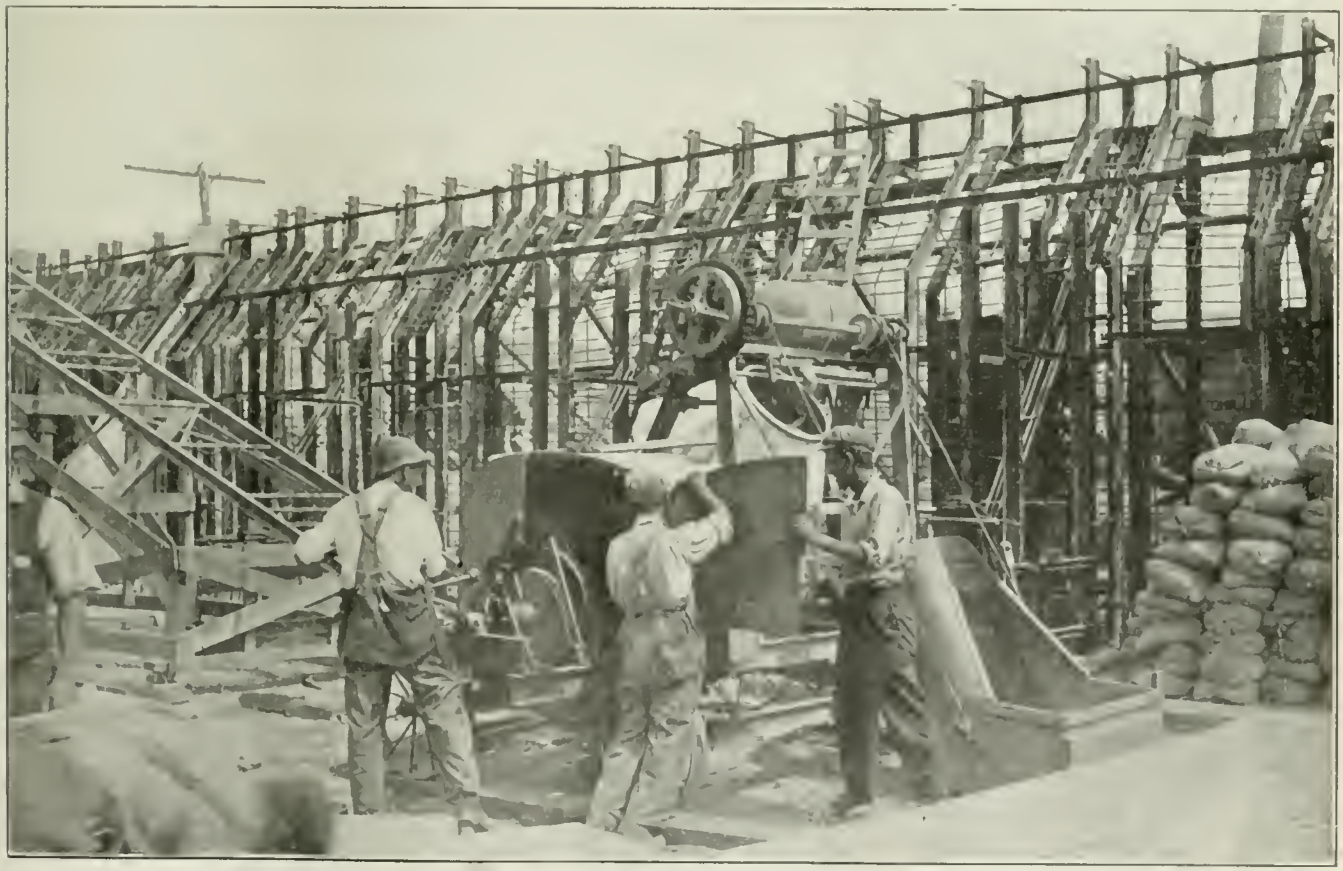
After-the-war prices on water works materials has greatly concerned superintendents of both municipal and privately owned water plants, but now that the war is on its fourth year and no end in sight, the public is gradually adjusting itself and becoming reconciled to war prices. The water works officials who have withheld improvements and postponed purchases, now find themselves in a sorry plight by facing a prospect of still higher prices after the war. Had the war been of short duration, things would have been different. The war has already lasted long enough to establish new economic conditions that will not be abandoned when the war is over.

The price and availability of labor, both skilled and unskilled, is one of the chief determining factors of prices. Mechanics and skilled workers in pump factories, valve and hydrant factories, meter factories and pipe foundries, are now receiving about twice to three times their former wages, and the labor having once accustomed themselves to short hours and high wages, new habits of living are formed. Imagine in your own case if, after enjoying for several years two hundred dollars per month, you were required to readjust your affairs to a salary of one hundred and fifty dollars. You probably would not accept it, but engage in something else of a similar nature. Labor of unskilled kind would not be content with reductions, and the labor that has gone to war will, upon coming back, be of an entirely different character from what it was when it left the water trenches for the fighting trenches. A few years' fighting for his country, seeing new lands, new cities and mingling with intense activity will completely transform the man to one of higher ideals and aspirations. He will no longer be content with the menial tasks. He will learn that he is capable of doing bigger things. The contractor, the farmer, the foundryman and the manufacturer who are looking for their labor back again after the war will look in vain, for their mental, moral and physical changes will be so great that the men who return will have other things in view.

Labor cannot help being the scarcest commodity in America for at least several years after the war. Previous wars, although trifles compared with this war, were examples of producing a scarcity in labor for years following their close.

A wonderful equalizing effect will also result. The restoration of ruined cities in Europe will attract American engineers, contractors and material dealers. We are now, as a result of our new knowledge of the world, bidding on foreign work with the same keenness as if the job were in the adjoining city. The immense merchant marine now used for war purposes will convey labor and materials readily to every part of the world. France, South Africa or Egypt will be almost as accessible as remote parts of America.

Foreign countries will not have the barriers that formerly existed. Our machinery, pumps, pipe, meters, filters and supplies of every description have, since the war started, been tried out and were so well liked that American factories are now busily engaged in shipping water works supplies to China, South Africa, Palestine



FORM FRAMES AND REINFORCEMENT FOR HIGHLAND PARK RESERVOIR

Note the elaborate form construction. In the foreground is the concrete mixer; at the left is the bottom of the inclined track up which the skip car carried the concrete, to dump it into a chute at the top.

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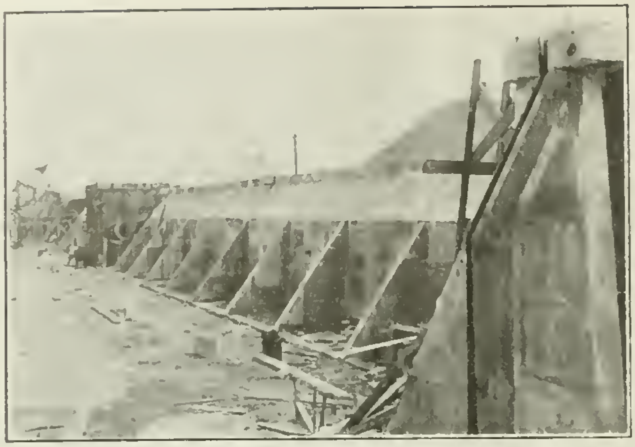
*Paper presented by R. E. McDonnell (of Burns & McDonnell, consulting engineers) before Southwestern Water Works Association, Tulsa, Oklahoma, April 24, 1918.



SOUTH WALL OF HIGHLAND PARK RESERVOIR.
Gate chamber in the mid-distance.

GENERAL VIEW OF HIGHLAND PARK RESERVOIR.
54-inch concrete pipe down the center. Longitudinal drainage ditches on each side of the pipe line.

and all South American republics; in fact, all over the world. Our mechanical filter plants have so pleased the South American countries that they will not be satisfied with any other. One of our assistant engineers now in Uruguay, supervising the installation of a water works, lighting and sewerage system, writes that the Uruguayan officials are so well pleased that American engineers, contractors and materials will have the preference. These markets opened up since the war are not going to close after the war.

A demand has been created that will continue, and demand is one-half the cause of price making. If the labor to produce the supply is going to be scarce, we then have a scarcity of supply and an increase in demand—two functions that tend to maintain high prices. Many cities have waited and continue to wait, expecting lower prices. Cities requiring water purification plants have continued to use polluted supplies, thereby endangering the health of their citizens, all because of a mistaken idea that prices would be lower. Fire protection equipment, both in pumps, larger mains and fire apparatus, has been postponed, awaiting lower prices after the war, until now we have inadequate fire protection in many cities. This condition, already alarming, is made doubly worse by the frequency of incendiary fires throughout the country. The holding off of these improvements until after the war would increase the normal demand to the point of producing an increase in prices following the war. Cast iron pipe, the largest item of cost in water works construction, is held down in price now only by the governmental control of the pig iron price, and with foundries already petitioning the Government to permit an increase, one can readily see that with the governmental control removed, the price would immediately go upward. The same is true of the copper market control. The demand for copper was never greater in the history of the world and when the Government regulation of price is removed, copper will immediately go upward to meet the demand. Cities, therefore, holding back lighting improvements or electrifying their pumping plants in anticipation of lower prices, are going to meet with disappointment. The war demand for water works materials has been no greater than similar demands for all classes of commodities. The use of American materials in the war has served to demonstrate their adaptability, which, in itself, will create new markets. One of the remarkable achievements of the war accomplished through American water works materials, was the capture of Palestine from the Turks. The capture of Palestine in the past was attempted many times in the last fourteen hundred years, and the British attributed the failures to the lack of water supply. With the use of American made pipe, pumps and valves and equipment, a ten-inch pipe line was laid one hundred and fifty miles across the desert, supplying drinking water for the troops, camels and munition trains. The pipe being carried in by use of camels, water was made available for use as the pipe laying progressed.

Facts taken from history give excellent precedents as to what we may expect in the future prices. In the period covered by the French Revolution, America was also engaged in war with England, so that at that period the whole civilized world was at war. While business was small then, yet prices went through the same performances they are repeating today. Prices after the war rose and remained at the maximum during the war for a period of about five years after the close of the war. In 1864 the increase was about fifty per cent above the normal of 1851. The decrease toward normal was only about twenty per cent, covering several years, with a sharp increase again at the Franco-Prussian War in 1871, and the prices did not return to normal until 1880, ten years after the close of the Franco-Prussian war.

Prices in time will undoubtedly seek their normal level, but cities, like individuals, need water for their growth. Can we afford to stunt the growth of a community by waiting for lower prices? This question has been carefully studied by those best competent to know. Recently a report was made by the New York Board of Water Supply to the Mayor of New York, which states that "there are no convincing evidences that labor and materials will be less expensive now than for several years to come," and further makes the suggestion that "many well informed persons are of the opinion that the tendency will be higher and still higher prices for water works commodities." The report closes with the recommendation that the city's interests will be best served by the continuous and speedy prosecution of the water works improvements to their final completion.

Water is fundamental to the growth and prosperity of every community. An abundant supply of good pure water is a city's most valuable asset. Its industries cannot be secured or maintained if the water supply is inadequate.

The Capital Issues Committee of Washington, D. C., in giving approval to water works bonds, has gone on record as to water supplies and their improvements as being an essential improvement, and all worthy projects are meeting prompt approval.

The essential feature in the whole problem to consider is the responsibility of the water works profession toward the health of the community. Nothing has such a great bearing upon the health of the community as the quality of the water. Can the water boards, mayors, superintendents and engineers afford to defer improvements when that postponement may mean an epidemic of typhoid or other water borne diseases? The loss of lives cannot be justified by the saving in dollars.

EXTENSION OF WATER MAINS

Powers and Obligations of Municipalities and Private Water Companies to Extend Water Mains—Determined by Reasonable Needs of Community.

By JOHN SIMPSON.

The power of a municipality to extend water mains, or to maintain them in particular places, is, in its nature, legislative and governmental in the absence of statute, and must of necessity be discretionary. If municipal authorities were compelled to construct or maintain water pipes whenever courts or juries might think proper, there would be an entire subversion of municipal government and control. Linck v. City of Litchfield (1888), 31 Ill. App. 118.

The council in each case must determine whether the necessity exists for the extension of a main to a particular territory, and what size main is needed, and whether the financial condition of the city will warrant the expenditure. Browne v. Bentonville (1910), 94 Ark. 80.

In Turners Falls Fire Dist. v. Millers Falls Water Supply Dist. (1905), 189 Mass. 263, 75 N. E., 630, it was held that a contract by a municipal corporation to supply water to its inhabitants did not require the water district to extend its mains to territory subsequently added to the municipality.

In Moore v. City Council of Harrodsburg (1907), 105 S. W. 926, the Kentucky court of appeals said: "The city officials are charged with the administration of the affairs of the city. They must determine when and where water mains must be put in, and when and how an electric light line must be extended. The courts cannot undertake to manage the affairs of a city by injunction. Where a public duty is enjoined, the court may require the city authorities to act, but it cannot control their discretion as to how they shall act. The city authorities are on the ground. They live among the people who pay the taxes. They can judge much better than we can as to what the best interest of the city requires. In the absence of fraud, corruption, or arbitrary action, the management of the affairs of the city is beyond judicial control."

A resident of South Gardiner, Maine, sought by mandamus to compel the trustees of the Gardiner water district to extend the water mains of the district to his residence, a distance of about five miles. His petition was denied. Lawrence v. Richards (1913), 111 Me. 95. The court said, with reference to the plaintiff's contention that the district was bound to supply every inhabitant with water: "If this contention has real merit, the consequence is that the trustees, acting for the district, are legally bound to supply water to all inhabitants, no matter how large the cost of the undertaking, nor how small the revenue, and no matter how ruinous and destructive the result might be to the financial ability of the district to carry on its operations. That this contention is not sound is, we think, easily demonstrable. The area of the district outside of the city proper and South Gardiner is scatteringly settled. The elevation in some places is considerably higher than the system's reservoirs. It does not need the testimony of expert engineers to satisfy a reasoning mind that under such conditions the expense necessarily to be incurred in performing the duty, as it is claimed to be, of supplying every inhabitant of the district with water would practically be destructive of the purposes of the charter. It would create a burden too heavy to be borne. Did the Legislature contemplate and intend such a possible result? Did the Legislature intend, when it empowered the cities of Lewiston and Bangor to own their water systems, with powers and duties with respect to the water supply similar to those of the Gardiner water district, that those cities were bound to furnish water over the entire extent of their territorial areas? We do not think so. It is a matter of common knowledge that water systems in towns or cities containing both an urban and a rural population, whether the systems be owned privately or municipally, never have been in fact, and are not now, anywhere, extended beyond the more compact parts of the town into and through the rural parts. It is practicable in the rural parts for inhabitants to supply themselves. In the thickly settled parts it gradually becomes inconvenient, impracticable, and sometimes impossible for the inhabitants to do so. Sources of supply become exhausted or defiled, and the need for more water, which the inhabitant cannot well furnish for himself, becomes imperative." In a later Maine case, Watson v. French (1914), 112 Me., 371, it was said, though not necessary for the decision of the case, that a water company is not compelled to extend its mains at the request of individual consumers. In Bothwell v. Consumers' Co. (1907), 13 Idaho, however, the court said, also *obiter*: "The company in the enjoyment of its franchise privileges is placed by the constitution under a public duty to supply water to all living within the franchise limits on payment of the rental rates. It owes this

POURING CONCRETE WALLS OF HIGHLAND PARK RESERVOIR.
Forms shown in place in foreground. In the background, concrete chute, skip dumping into same, and inclined track up which skip travels.

duty to everyone so long as it has water to sell, whether he be on the line of its main or at a great distance therefrom."

The duty of water boards to make extensions may, however, rest on statutes. Article 8, section 224, of the New York village law provides that a system of waterworks established under the article shall be under the control of the board of water commissioners, and that the board shall keep it in repair, and "may" extend the mains within the village, if the expense in any one year, in a village of the fourth class, shall not exceed $500, etc. It is held, People v. Pierce (1909), 119 N. Y. Supp. 21, that the word "may" would be here construed as meaning "must," and the board could be compelled by mandamus to make the extensions.

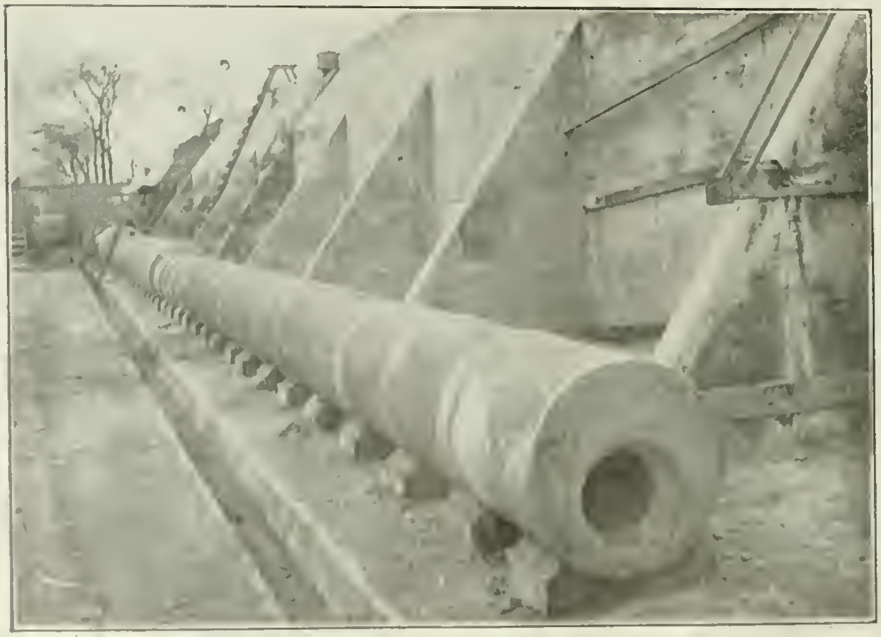
The California supreme court holds, Lukrawka v. Spring Valley Water Co. (1915), 169 Cal. 318, 146 Pac. 640, that when a water company accepted a franchise offered by the state, it assumed a contractual duty to be discharged for the public benefit—a community service commensurate with the privileges of its franchise requiring it to provide a system reasonably adequate to meet the wants of the inhabitants at its commencement, and also to extend the system as the reasonable wants of the growing community should require, so that, when in a position to make reasonable extensions of its mains bounding a populous part of the city of San Francisco, it was bound to and might be compelled to do so. This right to compel an extension to serve the inhabitants of a particular section of its territory is not, however, an absolute and unqualified right, but only to make an extension where there is a reasonable demand, depending on the particular facts of the case. The matter of expenditure to be entailed on the company in extending its service is not a controlling feature in determining the reasonableness of a demand for it, because the water rates established as a whole between the public service corporation and the city by the public body to which that duty is committed must be sufficient to yield a fair, just and reasonable income on the property of the company devoted to public use which would include such necessary expenditures. But additional expenditure by the company or an additional burden on the water rate payers as a whole should not be imposed for the benefit of a particular portion of the community unless a reasonable necessity for it exists.

A water company may, of course, contract to extend its mains to supply all the inhabitants within the territory for which it holds its franchises, and in such case it may be compelled by the mandamus to make the extensions. City of Topeka v. Topeka Water Co. (1897), 58 Kan. 349; Bourke v. Olcott Water Co. (1910), 84 Vt. 121. A provision in a city ordinance that a waterworks company shall extend its water mains "when requested to do so by a majority of all votes cast at any general or special election at which the proposition of such extension shall have been submitted to the people" means that the company is not required to make an extension unless a majority of all those voting on any proposition at such election vote in favor of the extension. Illinois Trust etc. Co. v. City of Burlington (1909), 79 Kan. 797.

By an amendment to the charter of the city of Hartford, its board of water commissioners was authorized, in 1865, to take the city's water supply from certain streams in the town of West Hartford, on condition that it would furnish the water to the inhabitants of that town who lived "within a reasonable distance from the line of main pipes," upon the same terms that it furnished the water to its own citizens. In an amicable statutory suit brought by the selectmen of the town on behalf of its inhabitants and property owners, to determine their rights and the powers and duties of the board, it was held, West Hartford v. Board of Water Comrs. of Hartford (1896), 68 Conn. 323, that the question whether an applicant for water which the board might refuse to furnish lived within a "reasonable distance" of the main line of pipes was for the determination of the courts.

Before ordering extension of a water company's mains a public utilities commission should be satisfied that the extension is within the scope of the original professed undertaking of the owner of the utility, and that after the extension is made, the owner will be insured a fair return upon his whole investment. Murray v. Public Utilities Commission (1915), 27 Idaho, 602. The Maryland supreme court holds, Public Service Commission v. Brooklyn & Curtis Bay Light & Water Co. (1914), 122 Md. 612, that section 42 of chapter 180 of the Maryland Acts of 1910, although giving to the public service commission broad powers over water companies, does not authorize it to require a water company to extend its plant into territory it has not attempted to serve, when the probable revenues would be insufficient to pay the cost of the extension and maintenance.

Various public utilities commissions have recently had under consideration the subject of the extension of water mains within and without municipal limits. The California railroad commission in a general order of August 12, 1915, held that a water, gas, electric or telephone utility which operates under a general franchise authorizing the occupancy of all the streets of a municipality shall make, at its own expense, such street extensions as may be necessary to serve applicants; provided that in any case in which the construction of an extension at the utility's sole cost will in its opinion work an undue hardship upon the utility or its existing consumers, the matter may be submitted to the commissioners. It was thought not feasible at that time to establish a general rule defining free limits for extension outside of municipalities. The commission asked the utilities to be as liberal



LATERAL PIPE IN HIGHLAND PARK RESERVOIR.
Drainage gutter shows just inside the line of concrete pipe.

as possible in the construction of extensions, but regard must also be had to the utility's financial condition and the rights of existing consumers. The Montana Public Service Commission holds (1915) that it cannot establish rules and regulations governing the extension of water mains in new localities, since the necessity for the extension must be determined from the facts of each case. The Nevada Commission, Public Service Com. v. Water Co. of Tonopah (1915), ordered a water company to make certain extensions to supply prospective customers where it appeared that the added income therefrom would return the company from 30 to 36 per cent on the necessary investment. The Kansas Commission holds, Leavenworth v. Leavenworth C. & F. L. Water Co. (1915), that a franchise provision that a water company shall not be obliged to extend its mains until an annual income of at least $125 per block is guaranteed is unreasonable. The West Virginia Commission holds, South Buckhannon v. Buckhannon Light & Water Co. (1915), that whether a water company undertaking to supply a municipality and its inhabitants may be required to extend its mains to supply all applicants where the return therefrom is insufficient to pay interest on the cost and outlay and to cover the natural depreciation and a proper proportion of the operating system depends on the reasonableness and necessity of the demand in each particular case.

WATER WORKS OPERATION STATISTICS

Information Contributed by Superintendents in About Four Hundred Cities Arranged in Tabular Form—Mechanical Appliances Used in Trench Work—Freezing and Thawing of Hydrants, Mains and Services.

In obtaining information for our annual water works statistics this year, we have confined ourselves largely to that dealing with the operation of water works, and in the following tables we present data furnished by superintendents of about four hundred water works plants relative to the labor-saving mechanical appliances used by them in excavating, backfilling or tamping trenches, in caulking pipe joints, and in inserting branches. Also, information concerning the practice of each city in making routine inspection of street valves. Considerable information was furnished relative to the experiences of the several cities with freezing of fire hydrants, mains, and services last winter and the methods employed in thawing them.

In later issues still further data will be given concerning cleaning of mains; methods employed for detecting and preventing leakage and waste; extent of the use of meters and practice as to ownership, rental charge, etc. Estimates of the amount of water which each city uses for municipal purposes and the amount that it obtains without any direct payment therefor, have been furnished by most of the cities. The frequency with which analyses of the water are made and whether by the cities' own experts, the state department of health, or private laboratories, and the quality of water, were covered by another set of replies, while the final question dealt with the use of watersheds and grounds around reservoirs and at pumping stations for public enjoyment as parks, picnic grounds, for skating, etc.

In the first table, a number of superintendents reported machines for making taps in reply to our question referring to those used for "inserting branches." These replies were omitted from the table, and only those machines included which were used for inserting pipes larger than 2 inches.

In the second table, in answering the second question a considerable percentage of the cities reported, as a part of the inspection service, inspection for leaks around the valve stem, the repacking of the stuffing box, oiling, cleaning out the valve box, etc. As it is assumed that any inspection which involved operating the valve would include this attention when shown to be necessary, this portion of the replies was omitted. Several cities reported as part of their inspection the locating of each valve (we presume by referencing it to prominent objects on the street surface); but as it would not seem to be necessary to do this more than once for each valve, this was not included in the table as a part of routine inspection.

While the use of electricity for thawing services and occasionally for thawing mains has become quite common during the past few years, we did not expect to find

(Continued on page 377.)

HIGHLAND PARK RESERVOIR NEARLY FULL OF WATER.
Shows the light standards on top of each expansion-joint buttress; also the tops of all the buttresses.

APPLIANCES USED IN WATER WORKS OPERATION.

	Labor-Saving Mechanical Appliances Used			Machines for Inserting Branches in Mains		
City and state	Excavating trenches	Backfilling or tamping trenches	Caulking pipe	Owned or rented	Kind Used.	Largest size of branch Inserted, inches.
California:						
Glendale	....	Scraper operated by motor truck	....	....	....	..
Los Angeles	Steam shovels for large trenches, Austin and Buckeye for small ones	....	....	Own	Mueller	8
Redlands	....	....	....	....	Mueller	4
Colorado:						
Colorado Springs	Contract all over 500 ft.	....	....	Own	A. P. Smith	12
Longmont	....	Slip	....	Own	....	..
Connecticut:						
Bristol	....	....	....	Own	Water Works Equipment Co.	10
East Hartford	....	....	....	Own	Water Works Equipment Co.	8
Middletown	....	....	....	Own	....	6
New London	....	....	....	Own	Smith	6
So. Manchester	....	....	....	Own	No. 2 Smith	12
Southington	....	Scraper and team	....	Rent	Water Works Equipment Co.	8
Suffield	....	....	....	Rent	....	6
Wallingford	....	....	....	Own	Water Works Equipment Co.	10
Georgia:						
Atlanta	....	....	Air compressor	Rent	A. P. Smith	20
Thomasville	....	Drag shovel	....	....	....	..
Tifton	....	Road machine	....	....	....	..
Illinois:						
Bloomington	....	....	....	Own	Smith	6
Champaign	....	....	....	Own	Smith	8
Downers Grove	Contract	....	....	....	....	..
Freeport	Trench machine	Tamper	....	Own	Smith	8
Lake Forest	Hire Austin machine	....	....	....	....	..
Peru	....	....	....	Own	Smith & Mueller	12
Quincy	....	....	....	Own	Smith No. 1	8
Rock Island	....	....	....	Own	Smith	10
Indiana:						
Bedford	....	....	....	Rent	Smith	6
La Porte	....	Scraper and horse	....	....	....	..
Lebanon	....	....	....	Rent	Smith	4
No. Manchester	Ditching machine	Scraper and horse	....	....	....	..
Terre Haute	....	Scraper and team	....	Own	Smith	20
Iowa:						
Boone	....	....	....	Own	Smith	8
Burlington	Parsons ditching machine and steam drills	Scraper with 2 horses	....	....	....	..
Cedar Rapids	....	....	....	Own	Smith	6
Creston	....	....	....	Rent	Smith	8
Maquoketa	....	....	....	Own	Mueller	10
Sioux City	....	....	....	Own	Smith	12
Vinton	Trench machine on big jobs	Backfill with teams	....	....	....	..
Kansas:						
Fredonia	....	Backfiller	....	Rent	Mueller	8
Independence	....	Power tamper	....	....	....	..
Manhattan	....	Slip and team	....	....	....	..
Topeka	....	....	....	Own	Smith	6
Wellington	....	Scraper and team	Contractor used air hammer	....	....	..
Kentucky:						
Louisville	....	....	....	Own	Smith	30
Maine:						
Augusta	....	....	....	Own	Smith	8
Maryland:						
Baltimore	Parson's excavator	....	Pneumatic caulkers	Own	Smith	36
Massachusetts:						
Adams	....	....	....	Own	Smith	6
Belmont	....	....	....	Own	Water Works Equipment Co.	8
Cambridge	....	....	....	Own	Smith	12
Cherry Valley	....	....	....	Rent	Mueller	6
Danvers	....	....	....	Own	Water Works Equipment Co.	12
Fitchburg	....	....	....	Own	Smith	8
Framingham	....	....	....	Own	Smith	8
Haverhill	....	....	....	Own	Smith	8
Millbury	....	....	....	Rent	Smith	8
No Adams	....	....	....	Own (a)	....	6
Northampton	....	....	....	Own	2 Smiths	10
Reading	....	....	....	Own	Water Works Equipment Co.	8
Saugus	....	....	Compressed air	....	....	..
Springfield	....	....	....	Own	Smith	30
Taunton	....	....	....	Own	Smith	8

Waltham	....	....	....	Own	Van Winkle	8
Weymouth	Air drills	Horse scraper	....	Own	Water Works Equipment Co.	8
Michigan:						
Battle Creek	For deep trenches, 4-leg derricks and 2-yd. cars	Gasoline power tamper; flat scrapers	....	Own	Smith	8
Big Rapids	....	Scraper and horse	....	Own	Mueller	10
Coldwater	....	Scraper and motor	....	....	....	..
Highland Park ...	....	....	Air hammer	Own	Mueller	8
Houghton	....	....	....	Own	Mueller	6
Jackson	Trenching machine on large jobs	Scrapers and 3½-ton truck	Air hammer on large sizes	Own	Mueller	6
Marquette	....	....	....	Own	Mueller	8
Mt. Clemens......	Parson's excavator	....	....	Own	Smith	6
Muskegon	....	....	....	Own	Smith	12
Petoskey	....	Scraper and team	....	....	....	..
So. Haven	Parson's excavator	Scraper and team	....	....	....	..
Traverse City	....	....	....	Own	Smith	6
Ypsilanti	....	....	....	Own	Smith	8
Minnesota:						
St. Paul	....	....	....	Own	Smith	6
Missouri:						
Trenton	....	Teams	....	....	....	..
Montana:						
Billings	....	....	....	Own	Smith	8
Bozeman	Austin trenching machine	"Double Quick"	....	....	....	..
Kalispell	....	Scraper and horse	....	....	....	..
Nebraska:						
Aurora	....	Scraper and team	....	....	....	..
Hastings	....	....	....	Own	Water Works Equipment Co.	8
Omaha	Buckeye Trenching machine	....	....	Own	Smith	12
New Hampshire:						
Berlin	Air drills	....	....	....	....	..
Concord	....	....	....	Own	Smith	8
New Jersey:						
Atlantic City	....	....	....	Own	Smith and Mueller	12(b)
Bridgeton	....	....	....	Own	Smith	10
Dover	....	....	....	Own	Van Winkle	10
Irvington	....	....	....	Own	Smith	8
Newton	....	....	....	Own	....	6
Pleasantville	....	....	....	Own	Smith	10
Princeton	....	....	....	Own	Mueller	8
Rahway	....	....	....	Own	Mueller	..
New Mexico:						
Raton	....	Road grader	....	....	....	..
New York:						
Elmira	Rent trench machine	Scraper and teams	....	....	....	..
Gloversville	....	....	Portable air compressor	....	....	..
Hoosick Falls.....	....	....	....	Own	Mueller	..
Homer	....	....	....	Rent	Smith	6
Jamestown	....	....	....	Own	Smith	16
Kingston	....	....	Compressed air	Own	Smith	8
Lancaster	....	....	....	Rent	Mueller	6
Mt. Vernon.......	....	....	....	Rent	Smith	12
Newburgh	....	....	....	Own	Smith	6
Olean	....	....	....	Own	Smith	8
Ossining	....	....	....	Rent	Water Works Equipment Co.	8
Solvay	....	....	....	Rent	Smith	8
Spring Valley.....	....	....	"Ideal" compressor	Own	Smith	20
Tarrytown	....	....	....	Rent	Water Works Equipment Co.	20
Waterloo	....	....	....	Own	Mueller	6
Waverly	....	....	....	Rent	Smith	8
North Carolina:						
Charlotte	....	....	....	Own	Mueller and Smith	6
High Point.......	....	....	....	Own	Smith	6
Raleigh	....	....	....	Own	Smith	6
North Dakota:						
Devil's Lake......	....	Scraper and team	....	....	....	..
Ohio:						
Cincinnati	Contract	....	....	Own	Smith	6
Cleveland	Trenching machine by contractor	Backfilling machine by contractor	....	Own	Smith	24
Conneaut	....	Scraper and horses	....	....	....	..
Dayton	Austin excavator	Waterloo "Double Quick" backfiller	Delaware air compressors and Dayton pneumatic hammers	Own	Smith	12
Kent	Trenching machine by contract	....	....	....	....	..
Lima	....	....	....	Own	Smith	6
Marietta	....	....	....	Own	Home-made	6
Painesville	....	....	....	Own	....	12

For footnote, see page 368.

APPLIANCES USED IN WATER WORKS OPERATION (Continued).

City and state	Labor-Saving Mechanical Appliances Used			Machines for Inserting Branches in Mains		
	Excavating trenches	Backfilling or tamping trenches	Caulking pipe	Owned or rented	Kind used	Largest size of branch inserted, inches
Ohio (Continued):						
Tiffin	Buckeye ditcher	....	Air compressor	Own	Smith	8
Toledo	....	....	....	Own	Smith	8
Urbana	....	....	....	Own	Mueller	6
Wapakoneta	Trenching machine	Team	....	Rent	....	6
Xenia	....	....	....	Rent	Smith	12
Oklahoma:						
Stillwater	....	....	....	Rent	....	6
Oregon:						
Hood River	....	....	....	Rent	....	4
Pennsylvania:						
Carbondale	....	....	....	Own	Smith	12
Catasauqua	....	....	....	....	....	..
Lancaster	Air drill	....	Air compressor	....	....	..
Meadville	....	....	....	Own	Smith	8
Media	....	....	....	Own	Smith	6
New Castle	Plow and scraper	Team	....	Own	Smith	12
Oil City	....	....	....	Own	Smith	8
Rhode Island:						
Woonsocket	....	....	....	Own	Smith	8
South Carolina:						
Florence	Plow and mule team	Drag scraper and team	....	....	....	..
South Dakota:						
Mitchel	Rent ditching machine	Scrapers and teams	....	....	....	..
Rapid City	....	Horse scraper	....	....	....	..
Tennessee:						
Memphis	....	....	....	Own	Smith	12
Texas:						
Abilene	....	Scraper and long chain	....	Own	Smith	6
Galveston	....	....	....	....	....	..
McKinney	....	Scraper and teams	....	....	....	..
Utah:						
Salt Lake	....	....	....	Own	Smith	12
Vermont:						
Bennington	....	....	....	Rent	Payne	12
Virginia:						
Charlottesville	....	....	....	Own	Mueller and Smith	8
Wisconsin:						
Fond du Lac	Gasoline trench pump	....	....	Own	Smith	8
Green Bay	....	....	....	Own	Smith	8
Janesville	....	Scraper and team	....	....	Smith	18
Milwaukee	Contract	....	....	Own	Mueller and Smith	8
Whitewater	....	....	....	Rent	Mueller	4
Wyoming:						
Rock Springs	Ditching machine	Teams	....	Own	Mueller	8
Canada:						
Toronto, Ont.	....	....	....	Own	Smith	20
Winnipeg, Man.	....	Scrapers and team	....	Own	Smith	8

a—Rent machine for larger sizes; b—Rent larger sizes up to 20 inch.

FREEZING AND THAWING. VALVE INSPECTION.

City and State.	How often do you inspect street valves?	Of what does such inspection consist?	Trouble with hydrants freezing last winter?	Method of thawing.	Did mains freeze last winter?	At what Depth?	Method of thawing	Did you thaw frozen Services?	Method of thawing.
Alabama:									
Gadsden	6 months	....	No	....	No	....	....	No	....
Talladega	Not regularly	See if leaking	No	....	No	....	....	No	....
Arizona:									
Nogales	Yearly	Open and close	No	....	No	....	....	No	....
Arkansas:									
Eldorado	Not regularly	....	No	....	No	....	....	Yes	Blow torch
California:									
Anaheim	Yearly	Open and close	...	....	...	....	....	....	....
Glendale	Not regularly	....	No	....	No	....	....	No	....
Los Angeles	Continuously	....	No	....	No	....	....	No	....
Oxnard	Semi annually or oftener	Open and close	No	....	No	....	....	No	....
Pacific Grove	....	Open and close	No	....	No	....	....	No	....
Redlands	Yearly or oftener	Repacking and oiling	No	....	No	....	....	No	....
Riverside	Once a month	Open and close, inspect packing	No	....	No	....	....	No	....
Santa Maria	Every 4 months	....	No	....	No	....	....	No	....
Stockton	Annually	General	No	....	No	....	....	No	....

Colorado:									
Colorado Springs..	Annually	Open and close	No	....	No	....	....	No	Consumers hire plumbers
Longmont	Not regularly	Open and close	No	....	No	....	....	No	....
Connecticut:									
Ansonia	Not regularly	Repacking	Yes	Steam	Yes	3 or 4 ft.	Electricity	Yes	Hot water and steam
Bristol	Not regularly	....	Yes	Steam	No	....	....	Yes	Electricity and steam
East Hartford.....	Annually	Open & close, test leaks	Yes	Electricity	Yes	3½ to 5½ ft.	Electricity	Yes	Electricity
Middletown	Annually	Open and close	Yes	Exhaust steam from auto trucks	Yes	3 ft.	Electricity	Yes	Electricity
New London	Annually	....	A few	Hot water and salt	Little	4 ft.	Hot water injector and electricity	Yes	Injector and electricity
South Manchester..	None	....	Yes	Hot water	Yes	6 ft.	Electricity & digging	Yes	Electricity
Southington	Every 6 months	Inspecting valve boxes, stuffing boxes, open & close valves	No	....	No	....	....	Yes	Hot water and force pump
Suffield	None	....	No	....	Some	4 ft.	Electricity	Yes	Electricity
Wallingford	Annually	Open and close	Yes	Steam	Yes	4.5 ft.(a)	Electricity	Yes	Electricity and hot water
Willimantic	....	....	Yes	Electricity	Yes	4½ to 5 ft.	Electricity	Yes	Electricity
Windsor Fire Dist.	Annually	Open and close	Yes	Pumped hot water into barrel	No	....	....	Yes	Hot water & electricity
Florida:									
Daytona	Twice a year	Open & close, valve box	No	....	No	....	....	No	....
De Land	Monthly	....	No	....	No	....	....	No	....
St. Augustine......	Every 90 days	Open and close	No	....	No	....	....	No	....
Georgia:									
Americus	Semi annually	Determine if open	No	....	No	....	....	No	....
Atlanta	Annually	Open and close	No	....	No	....	....	No	....
La Grange.........	Annually	Open and close	No	....	No	....	....	No	....
Milledgeville	Semi annually	Cleaning	No	....	No	....	....	No	....
Thomasville	Annually	Open, close and oil	No	....	No	....	....	No	....
Tifton	Quarterly	Open and close	No	....	No	....	....	No	....
Waynesboro	Semi annually	Cleaning	No	....	No	....	....	No	....
Idaho:									
Boise	Annually	Open and close	No	....	No	....	....	No	....
Lewiston	....	....	No	....	No	....	....	Yes	Electricity
Twin Falls........	Monthly	Open and close	No	....	1916	3½ ft.	Electricity	Some	....
Weiser	Annually	General condition	No	....	No	....	....	No	....
Illinois:									
Bloomington	Semi annually	Open and close	No	....	No	....	....	No	....
Champaign	Annually	Open and close	Few	Repack stuffing box	No	4 ft.	....	Yes	Gasoline-driven generator
Downers Grove...	Not regularly	....	....	....	..	....	....	No	Dug up those burst
Flora	Every 4 months	Open and closed	No	....	Yes	8 feet(b)	....	No	....
Freeport	Annually	See if working	No	....	No	....	....	No	....
Lake Forest......	Annually	Open and close	One	Used fire	No	....	....	Yes	Electricity
Marshall	Annually	Open and close	Yes	Dug them up	No	....	....	Yes	Dug up
Mendota	Annually	Cleaning and oiling	No	....	No	....	....	....	Plumbers do it.
Mt. Vernon	Annually	Open and close, inspect for leaks	No[m]	....	Yes	3	Electricity	Yes	Electricity
Paris	....	....	Very little	....	No	....	....	Yes	Dug up
Peru	When flushing hydrants	....	No	....	No	....	....	Yes	Electricity
Quincy	Not regularly	....	No	....	No	....	....	No	....
Rock Island.......	When out of order	....	No	....	No	....	....	Yes	Electricity
Watseka	Twice a year	Test tightness by clos'g	No	....	No	....	....	Yes	Electricity
Indiana:									
Bedford	....	....	No	....	No	....	....	Yes	Electricity
Brookville	When sh'ting off press.	....	Three	With fire	No	....	....	No	....
Delphi	Not at all	....	No	....	No	....	....	No	....
Elwood	Annually	Open and close	Yes	Build fire around	No	....	....	No	....
Fort Wayne......	2 or 3 times a year	Open and close	No	....	Yes	4½ ft.	Electricity	Yes	Electricity
Goshen	Annually	Open and close	Some	Steam from traction engine	Yes	4½	Steam from traction engine	No	....
Knightstown	Never	....	No	....	No	....	....	No	....
La Porte..........	Annually	Test tightness by clos'g	No	Steam	No	....	....	No	Steam or electricity
Lebanon	Annually	Oil, open and close	No	....	Yes	3 ft.	Electricity	Yes	Electricity
Linton	....	....	Slight(c)	....	No	....	....	One	....
Mishawaka	Annually	....	Two	Electricity	No	....	....	Yes	Electricity
No. Manchester ...	Annually or oftener	Examining and testing	Yes	Steam or fire	No	....	....	A few	Syphoned hot water
Peru	Annually	Testing	No	....	No	....	....	Yes	Steam
Plymouth	4 times a year	Open and close	No	....	No	....	....	No	....
Terre Haute	Once in 2 years	Open and close	Yes	Hot water	No	....	....	Yes	Hot water or steam through ¼-in. block tin pipe
Tipton	Annually	Inspect packing	No	....	No	....	....	No	....
Vincennes	Annually	Packing and tightness	No	....	No	....	....	Yes	Electricity

For footnote, see page 374.

FREEZING AND THAWING. VALVE INSPECTION (Continued).

City and State.	How often do you inspect street valves?	Of what does such inspection consist?	Trouble with hydrants freezing last winter?	Method of thawing.	Did mains freeze last winter?	At what Depth?	Method of thawing	Did you thaw frozen Services?	Method of thawing.
Iowa:									
Boone	Semi-annually	Clean valve boxes	Yes	Steam	Yes	5 ft.	Steam and electricity	Yes	Electricity
Burlington	Annually	Open and close	No	....	No	....	....	No	....
Cedar Falls	Annually	....	No	....	No	....	....	Yes	Electricity
Cedar Rapids	....	....	Yes	Steam	No	....	....	No	....
Creston	Annually	Test	No	....	No	....	....	Yes	Electricity
Fort Madison	....	....	Yes	Hot water and steam	No	....	....	Yes	Hot Water and steam
Hawarden	Twice a year	Open and close	Yes	Steam	No	....	....	Yes	Small steam boiler
Maquoketa	Twice a year	Test tightness	No	....	No	....	....	No	Done by plumbers
Sioux City	Annually	....	Very little	With Salt	Two	4½ ft.	Uncov. & put fire around	No	....
Spencer	Each fall	Test tightness & pack.	No	....	No	....	....	Yes	Electricity
Stanton	3 or 4 times a year	Open and close	No	....	No	....	....	Yes	Hot water and blow torch
Vinton	....	....	No	....	No	....	....	No	....
Washington	Annually	....	No	....	No	....	....	No	....
Winterset	Annually	....	No	....	Yes	3 ft.	Let warm weather do it	Yes	Boiler and brass tubing
Kansas:									
Chanute	Annually	Open and close and oil	No	....	Yes	1½ ft.	Electricity	Yes	Electricity
Coffeyville	Annually	Open and close	Some	Hot water	Some	2 ft.	Steam and electricity	Yes	Steam and electricity
Council Grove	Frequently	Open and close	No	....	No	....	....	No	....
Emporia	Not systematically	....	Yes	Warm weather did it	Yes	2 ft.	Dug up and used torch	No	Plumbers do it
Fredonia	Annually	Op., close, inspect pack'g	No	....	No	....	....	No	....
Great Bend	Twice a year	Open and close	Some	Electricity	No	....	....	Yes	Electricity
Hiawatha	Not regularly	....	No	....	No	....	....	No	....
Horton	Quarterly	Open & close, inspect packing	No	....	Yes	2½ ft.	Didn't	Yes	Dug up
Independence	Not regularly	....	Yes	Fire or steam	Yes	2½ ft.	Warm weather did it	Yes	Steam or dug up
Larned	Twice a year	Open & close, inspect packing	No	....	Yes	1 ft.	Electricity	Yes	Electricity
Manhattan	Annually	Repack and inspect	Yes	Used salt	No	....	....	No	....
McPherson	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Neodesha	Annually	Open & close, inspect packing	No	....	...	....	....	...	....
Newton	When required	....	No	....	A few	2 ft.	Warm weather did it	No	....
Osage City	Twice a year	....	No	....	No	....	....	Yes	Electricity
Osawatomie	....	Open & close	No	....	No	....	....	No	....
Topeka	Annually	Open & close, clean boxes	Yes	Fire around them	No	....	....	A few	Steam
Wellington	Annually	Open & close, test tightness	No	....	Yes	2 ft.	Electricity	Yes	Electricity
Kentucky:									
Hopkinsville	2 or 3 times a year	Repacking	No	....	Some	2½ ft.	Blow torches	Yes	Blow torches
Lexington	Semi-annually	Open and close	No	....	No	....	....	Yes	Electricity
Louisville	Annually	Open & close	No	....	No	....	....	Yes	Large, elec., small, hot water
Paris	Annually	Open & close, test tightness	Some	Used fire	No	....	....	No	....
Richmond	Not regularly	Open & close	No[d]	....	No	....	....	Yes	Electricity
Shelbyville	Frequently	General	No	....	No	....	....	Yes	Electricity
Louisiana:									
Ruston	Twice a year	....	No	....	No	....	....	No	Plumbers do it
Maine:									
Augusta	Annually	Open & close	No	....	No	....	....	2	Thawing tube
Calais	When used	....	No	....	No	....	....	Yes	Hot water & thawing tube
Farmington	Annually	Locate	No	....	No	....	....	Yes	Hot water
Ft. Kent	Not at all	....	No	....	No	....	....	No	....
Norway	Annually	....	No	....	No	....	Electricity	Yes	Electricity
Van Buren	Annually	Repack, inspect bolts	Yes	Hot water, pump and tin pipe	No	....	....	No	....
Sanford	Twice a year	....	Yes	Hot water	Yes	5 ft.	Electricity	Yes	Hot water
Maryland:									
Baltimore	When operated[a]	....	Yes	Flame torch	Yes	3 to 6 ft.	Direct flame	Yes	Elec., portable generator
Massachusetts:									
Adams	Annually	Open & close	No	....	One	4½ ft.	Charcoal and electricity	Yes	Block tin pipe
Athol	....	....	Yes	....	Yes	6 ft.	Electricity	Yes	Electricity
Barre	Twice a year	Flushing	No	....	...	....	....	...	....
Belmont	Annually	Open & close, inspect packing	Yes	Electricity and thaw pump	Yes	5 ft.	Electricity	Yes	Electricity & thaw pump
Cambridge	Annually	Open & close	Yes	Hot water	Four	1½ ft.	Elec., pump & hot water	Yes	Electricity & hot water
Cherry Valley	Spring and Fall	Inspect boxes	No	....	No	....	....	Yes	Steam and hot water
Danvers	Frequently	Open & close	Yes	Steam & electricity	Yes	5 ft.	Electricity	Yes	Hot water & electricity
Falmouth	Annually	Open & close	No	....	Yes	4 ft.	Electricity	Yes	Electricity
Fitchburg	Annually	....	Yes	Steam	Some	5 ft.	Electricity	Yes	Hot water & electricity
Franklin	Annually	Open and close	One	Did not thaw	Yes	5	Waited for hot weather	Yes	Electricity and tube
Framingham	....	....	Yes	Steam	Yes	5 ft.	Electricity	Yes	Hot water & electricity
Haverhill	Annually	Open & close	Yes	Electricity	Yes	6 ft.	Electricity	Yes	Electricity
Lenox	When leaking	....	No	....	No	....	....	No	....

Mansfield	Twice a year	Open & close	Some	Electricity	No	....	....	Yes	Electricity
Medway	Annually	Open & close	No	....	Yes	4½ ft.	Didn't	Yes	Hot water & block tin pipe
Millbury	Not regularly	Open & close, clean box's	No	....	Yes	5 ft.	Electricity	Yes	Electricity, and pump with block tin pipe
Monson	....	....	No	....	No	....	....	No	....
North Adams	When necessary	Test tightness	Yes	Hot water or elec'y.	Yes	6½ ft.	Electricity	Yes	Electricity or hot water
Northampton	Twice a year	Open & close, and oil	Yes	Steam boiler or pipe	Yes	5 ft.	Steam boiler and pipe	Yes	Burbank thawing machine
Orange	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Reading	Not regularly	....	No	....	Yes	4½ ft.	Electricity	Yes	Electricity
Saugus	....	....	Yes	Electricity	Yes	4½ ft.	Electricity—Hauck thawing machine	Yes	Electricity and hot water
Spencer	Twice a year	Inspect packing, clean boxes	No	....	Three	4 ft.	Didn't	No	Owners do it
Springfield	Once or twice a year	Open and close	A few	Hot water	No	....	....	Yes	Electricity and hot water
Taunton	Annually	Open and close	Branches	Electricity	A few	5 ft.	Electricity	Yes	Electricity and hot water
Turners Falls	Semi-annually	Open and close	Yes	Electricity	Yes	5	Electricity	Yes	Forced hot water into service
Walpole	Annually	Open and close, and oil	Yes	Electricity	Yes	4½ ft.	Electricity	Yes	Electricity and hot water
Waltham	Twice a year	Open and close	Yes	Steam or hot water	Yes	3½ to 5 ft.	Steam or electricity	Yes	Hot water or electricity
Wellesley	When used	Open and close	Some	Electricity	Some	6 ft.	Electricity	Yes	Electricity and hot water
Weymouth	Annually	Open and close	Yes	Hot water or electricity	Yes	5 ft.	Electricity	Yes	Hot water
Michigan:									
Albion	....	....	Two	Loosened caps, let them thaw naturally	Two	4 to 5 ft.	Didn't	Yes	Steam and tube
Alma	Often	Test for tightness	No	Steamer	No	....	....	Yes	Electricity
Battle Creek	Once or twice a year	Open and close	Little	Small steam boiler	No	....	....	Yes	Electricity
Big Rapids	Twice a year	Test for leakage	Slight	Steam boiler on sled	No	....	....	Yes	Electricity
Coldwater	Not regularly	....	No	....	Yes	5½ ft.	Electricity	Yes	Electricity
Crystal Falls	Twice a year	....	Yes	Electricity and steam	Yes	7 ft.	Electricity	Yes	Electricity
Grand Rapids	Annually	....	Yes	Boiler on auto	No	....	....	No	Done by electrical co.
Hastings	Annually	Test for leaks, repack	No	....	No	....	....	No	....
Highland Park	Annually	Open and close	Yes	Use salt	No	....	....	No	Done by light co.
Houghton	Monthly	Test for leakage	No	....	One	5 ft.	Electricity	Yes	Electricity
Iron Mountain	Twice a year	Open and close	Some	Electricity	Some	7 ft.	Electricity	Yes	Electricity
Ishpeming	Annually	Open and close	No	....	No	....	....	Yes	....
Jackson	Annually	General inspection	Some	Steam	Yes	3 to 5½ ft.	Steam and electricity	Yes	Steam and electricity
Manistee	Semi-annually	Open and close	No	....	No	....	....	Yes	Steam
Marquette	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Mt. Clemens	Annually	Open and close	One	Steam	One	5½ ft.	Didn't	No	....
Muskegon	When necessary	Open and close	Few	....	No	....	....	No	....
Paw Paw	Twice a year	Open and close	No	....	No	....	....	No	....
Petoskey	Annually	Trying out	Slight	Steam	No	....	....	Yes	Steam
South Haven	Spring and Fall	Open and close, test tightness	No	....	No	....	....	Yes	Electricity
Traverse City	Annually	Open and close	Yes	Hot water	No	....	....	Yes	Electricity
Yale	When defect suspected	....	Two	Salt and alcohol	No	....	....	Four	Electricity
Ysilanti	Annually	Open and close	Yes	Hot water	Yes	5 ft.	Electricity	Yes	Electricity
Minnesota:									
Eveleth	Annually	Valve and box	Slight	Small steamer	No	....	....	Yes	Electricity
Fairmont	Annually	Test for leaks	No	....	No	....	....	No	....
Lake City	Annually	Open and close	Yes	Steam hose	No	....	....	Yes	Steamer
Moorhead	When they give trouble	....	Yes	Steam	No	....	....	Yes	Electricity
St. Paul	Spring and Fall	Open and close; listen for leaks	Yes	Steam	Yes	7½ ft.	Apply heat	Yes	Electricity
Willmar	....	....	No	....	Yes	6 ft.	Electricity	Yes	Electricity
Mississippi:									
Water Valley	....	....	No	....	Some	10 in.	Uncovered and built fire	Some	Uncovered and built fire
Missouri:									
Albany	4 times a year	Open and close	No	....	One	3 ft.[b]	Didn't	No	....
Boonville	When something wrong	....	No	....	Yes	2 to 3 ft.	Dug up and flushed with water	No	Plumbers do it
Carrollton	Annually	Repack and examine	No[f]	....	No	....	....	No	....
Farmington	....	....	....	....	..	....	....	Yes	Electricity or digging up
Fulton	Semi-annually	Open and close	No	....	No	....	....	No	Plumbers used torch
Trenton	Always watching	Open and close	No	....	No	....	....	No	Plumbers do it
West Plains	Annually	Open and close	One	Built fire around	No	....	....	No	....
Montana:									
Billings	Annually	Open and close	Yes	Steam	No	....	....	One	Dug up
Bozeman	Quarterly	Open and close	No	....	No	....	....	No	....
Helena	Annually	Open and close	Yes	Electricity	No	....	....	No	....
Kalispell	Twice a year	Open and close	No	....	No	....	....	Yes	Electricity
Libby	Annually	Complete	No	....	No	....	....	Yes	Electricity
Livingston	Annually	Pack and general	No	....	No	....	....	No	....
Nebraska:									
Alliance	Annually	Open and close	No	....	Yes	4½ ft.	Electricity	Yes	Electricity
Aurora	When used	....	Yes	Didn't	Yes	2 to 4 ft.	Dug up and used fire, or electricity	Some	Same as mains

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For footnote, see page 374.

FREEZING AND THAWING. VALVE INSPECTION (Continued).

City and State.	How often do you inspect street valves?	Of what does such inspection consist?	Trouble with hydrants freezing last winter?	Method of thawing.	Did mains freeze last winter?	At what Depth?	Method of thawing	Did you thaw frozen Services?	Method of thawing.
Nebraska (Cont.):									
Grand Island......	Annually	Open and close	No	....	No	....	....	No	....
Hastings	Annually	Open and close	No	....	No	....	....	No	....
Omaha	Annually and triennially	Open and close	Yes	Steam from portable boiler	No	....	....	No	Plumbers do it
Schuyler	Annually	Open and close	A few	Salt and hot water	No	....	....	No	....
New Hampshire:									
Berlin	Biennially, some oftener	....	Yes	Hot water	No	....	....	Yes	Electricity and Burbank machine
Claremont	2 or 3 years	Open and close, clean boxes	No	....	No	....	....	Seven	Hot water
Concord	Triennially	Open and close	Yes	Steam boiler, also exhaust from truck	No	....	....	Yes	Electricity, hot water and block tin pipe
Dover	....	....	Yes	Hot water	No	....	....	Yes	Hot water and pipe
Franklin	Not regularly	....	No	....	No	....	....	Yes	Electricity
Lebanon	When needed	....	One	Burst before discovered	No	....	....	Yes	Electricity
Milford	Frequently	Open and close	A little	Steam or hot water	One	5 ft.	Didn't	Yes	Hot water and pipe
Newport	When necessary	....	No	....	No	....	....	Three	Poured in hot water
Rochester	Annually	....	Yes	Steam	No	....	....	Yes	Hot water
New Jersey:									
Atlantic City......	Not regularly	....	Some	Steam from fire engine	Slight	2 ft.	Steam jet throuh corporation cock	Yes	Steam jet
Bridgeton	Semi-annually	Open and close	A little	Steam	Yes	3½ ft.	Let nature do it	Yes	Electricity
Dover	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Hawthorne	Annually	Open and close, test for leakage	No	....	No	....	....	Yes	Hot water through small pipe
Helmetta	....	....	No	....	Yes	3½	Steam[a]	Yes	Same as mains
Irvington	Annually	Open and close	No	....	No	....	....	Yes	Steam
Jamesburg	Annually	Open and close	Three	....	..	....	....	Yes	Steam
Milltown	Twice a year	Open and close	No	....	No	....	....	No	Plumbers insert steam pipe
Newton	Every 4 months	Open and close	No	....	No	....	....	Yes	Electricity
Nutley	Biennially	Open and close	A little	....	No	....	....	Yes	Portable steam boiler
Pleasantville	Annually	Open and close	Yes	Built fire around	Yes	4½	Electricity—unsuccesful	Yes	Electricity
Princeton	Do not	....	No	....	No	....	....	No	....
Rahway	Twice a year	Testing	No	....	No	....	....	No	....
New Mexico:									
East Las Vegas...	When used	....	No	....	No	....	....	No	....
Raton	Annually	Open and close	No	....	No	....	....	No	....
New York:									
Amityville	When necessary	Open and close	Yes	Steam	Yes	4 ft.	Electricity	Yes	Electricity
Dansville	Twice a year	General	Yes	Steam & electricity	Yes	4 to 6 ft.	Electricity	Some	Steam and electric light co.
Elmira	....	....	Two	Electricity	Yes	5 ft.	Electricity	No	Privately, by electricity
Glens Falls.......	Annually	Open and close	Yes	Steam	No	....	....	Yes	Hot water and electricity
Gloversville	Annually	Testing and packing	Yes	Salt, wood-alcohol, electricity	No	....	....	Yes	Electricity
Hoosick Falls.....	Twice a year	Open and close	Yes	Steam	One	5 ft.	Electricity	Yes	Electricity
Homer	....	....	No	....	No	....	....	No	....
Jamestown	Annually	Open and close	No	....	Yes	4 to 5 ft.	Electricity	Yes	Electricity
Kingston	Occasionally	Test by sections	Yes	Steam	Some	5½	Electricity	No	....
Lancaster	Annually	Open and close	Yes	Steam	No	....	....	Yes	Electricity
Mechanicsville ...	Twice a year	Open and close	Yes	Steam	No	....	....	No	....
Mount Morris.....	New plant	....	No	....	Yes	4½ ft.	Some still frozen	Yes	Electricity
Mt. Vernon........	At least once a year	Open and close	Very little	By steam	Yes	3 or 4 ft.	Electricity	Yes	Electricity
Newburgh	Semi-annually	Open and close	Yes	Steam & electricity	Yes	4 ft.	Steam and Electricity	Yes	Electricity
Orleans	Not regularly	....	No	....	No	....	....	Yes	Electricity
Oneonta	Annually	Open and close	Yes	Steam	Yes	5 ft.	Cut out section and used steam	..	Electricity
Ossining	Annually	Open and close	Some	Steam	One	4 ft.[b]	Electricity	Yes	Electricity, steam, torch
Oswego	Once a month	Test tightness	Yes	Electricity	Yes	4 ft.	Electricity	Yes	Electricity
Peekskill	When necessary	....	No	....	One	1½ ft.	Electricity	No	Consumers do it
Seneca Falls......	Not regularly	....	No	....	No	....	....	Yes	Steam
Sidney	Annually	Open and close	Yes	....	One	5½ ft.	Uncovered and used fire	No	Plumbers use steam
Solvay	Twice a year	Test tightness	No	....	No	....	....	Yes	Electricity
Spring Valley.....	When required	Remove bonnet	No	Used salt	No	....	....	No	Plumbers do it
Tarrytown	Annually	Open and close	One	Keronese torch	One	2½ ft.[g]	Electricity	Yes	Electricity
Tonawanda	Annually	....	Yes	Steam	No	....	....	Yes	Steam
Waterloo	Annually	Open and close	Some	By fire	No	....	....	Yes	Steam or electricity
Waverly	Annually	Open and close	Very little	....	No	....	....	Yes	Electricity
North Carolina:									
Charlotte	Irregular intervals	....	No	....	No	....	....	Yes	Fires and torch
High Point.......	No inspection	....	One[h]	By fire around it	No	....	....	Yes	Digging or electricity
Lenoir	Annually	Stem and packing	Yes	Burning oil	No	....	....	Yes[i]	....
Newbern	When used	General	Yes	Steam or oily waste	No	....	....	No	....

Raleigh	Annually	Open and close	No	....	No	....	....	No	....
Rocky Mount	Annually	Open and close	No	....	No	....	....	Some	Kerosene torch
Statesville	Annually	Open and close	Yes	Oil and waste	No	....	....	Yes	Dig up
North Dakota:									
Devil's Lake	Semi-annually	Open and close	No	....	No	....	....	No	....
Grand Forks	When out of order	....	No	Steam	No	....	....	No	....
Wahpeton	Semi-annually	Open and close	No	....	No	....	....	No	....
Ohio:									
Bryan	....	....	Some	Truck exhaust through hose into hydrant	No	....	....	No	....
Celina	Annually	Open and close	No	....	No	....	....	No	....
Cincinnati	Annually	Open and close, test for leaks	Yes	Steam	Yes	3 ft.	Fire	No	Consumers do it
Cleveland	Not regularly	....	Some	Steam from fire engines	No	....	Yes	Yes	Electricity
Conneaut	Annually	Open and close	No	....	No	....	....	Yes	Electricity and hot water
Coshocton	Annually	Test for leaks	No	....	No	....	....	No	....
Dayton	When men available	Test by districts	Three	....	A little	4½ to 5 ft.	Electricity	Eight	Electricity
Defiance	Annually	Open and close	No	....	Yes	3½ ft.	Steam	Yes	Steam
Eaton	4 times a year	Open and close	No	....	No	....	....	No	....
Franklin	....	....	No	....	No	....	....	No	....
Gibsonburg	Twice a year	Test tightness	No	....	No	....	....	No	....
Kent	Annually	Open and close	No	....	Yes	4 ft.	Electricity	Yes	Electricity
Lima	When used	....	Yes	Fire around it	No	....	....	Yes	Steamer and hose
Marietta	Twice a year	Open and close	Yes	Buckeye heater	Yes	2½ to 3 ft.	Buckeye heater	No	Plumbers do it
Milan	Twice a year	Keep in working order	No	....	No	....	....	No	....
Mt. Gilead	Annually	Open and close	No	....	No	....	....	No	....
Mt. Vernon	Annually	Open and close	No	....	No	....	....	Yes	Steam
Painesville	Not regularly	Open and close	Yes	Electricity	No	....	....	Yes	Electricity
St. Marys	When used	....	Yes	Didn't	Yes	2 ft.	Fire under them	No	....
Tiffin	Annually	Open and close	No	....	One	4½ ft.	Electricity	No	....
Toledo	Annually	Open and close	Yes	Clow hydraulic steamer	No	....	....	Yes	Steamer with small hose
Troy	Twice a year	Open and close	No	....	No	....	....	No	....
Urbana	When leaking	....	Yes	Steam	Yes	3½ ft.	Electricity	No	....
Wadsworth	Twice a year	....	No	....	Yes	4 ft.	Steam thawing machine	Yes	Same as mains
Wapakoneta	Annually	Box and gate	No	....	No	....	....	Yes	Electricity
Wauseon	Annually	Packing	Yes	With steam	No	....	....	No	....
Xenia	When used	....	No	....	No	....	....	No	....
Oklahoma:									
Guthrie	Twice a year	Open and close	No	....	Yes	1½ ft.	Blow torch	Yes	Blow torch
Pawhuska	Once a year	Repacking	Yes	Wood fires	Yes	1½	Wood-fires	Yes	Wood-fires
Stillwater	Occasionally	....	No	....	No	....	....	No	....
Woodward	When needed	....	Yes	....	No	....	....	No	....
Oregon:									
Baker	Twice a year	Open and close	Yes	Electricity	Yes	3 to 4 ft.	Electricity	Yes	Electricity
Eugene	Annually	Open and close	No	....	No	....	....	No	....
Hood River	Annually	Open and close	No	....	No	....	....	No	....
La Grande	Semi-annually	Test tightness	No	....	No	....	....	No	....
Pennsylvania:									
Ambler	Spring and Fall	Valve box clean	Some	Steam boiler & hose	Three	3 ft.	Broken, were removed	No	Consumers do it
Barnesboro	Spring and Fall	Packing	No	....	Yes	4 ft.	Left till Spring	Yes	Steamer and hose
Carbondale	April and October	Open and close	Not much	Electricity	Not much	3 to 4 ft.	Electricity	No	Electric co. does it
Catasauqua	Annually	General	No	....	No	....	....	No	....
Chambersburg	Annually	Open and close	Little	Gasoline	No	....	....	Yes	Electricity
Clearfield	When used	Open and close	No	....	One	4 ft.	By steam	Yes	By steam
Duquesne	Annually	Open and close	Yes	With fire	Yes	3 ft.	Dig them up	Yes	Steam boiler
E. Stroudsburg	Monthly	Open and close	Yes	Electricity	Yes	3 ft.	Electricity	Yes	Electricity
Hanover	....	....	No	....	Yes	3 ft.	Abandoned	No	....
Juniata	Frequently	Examine for leakage	Little	Hot water	No	....	....	Yes	Electricity
Lancaster	Triennially	Leakage survey	No	....	No	....	....	Yes	Electricity
McDonald	4 times a year	Test	Yes	Hot water	No	....	....	No	....
Meadville	Not regularly	....	No	....	Yes	4 ft.	Steam	..	Steam
Media	Twice a year	Open and close	No	....	Yes	3 ft.	Thawed themselves or broke	No	Consumers by electricity
Minersville	Twice a year	Open and close	No	....	Yes	3 ft.	Pipes burst	Yes	Electricity
New Castle	Annually	Open and close	Yes	Fire around them	Yes	5 ft.	Electricity	Yes	Electricity
Oil City	Not regularly	Open and close	Yes	Hot water through pipes	Yes	2½ ft.	Didn't	Yes	Electricity
Pottsville	Annually	Open and close	No	....	No	....	....	No	....
Slatington	Annually	Packing	Yes	Steam	No	....	....	Yes	Plumbers do it
S. Brownsville	Not regularly	....	Yes	Steam from Ford car radiator	Some	3 ft.	Electricity	Yes	Electricity
Susquehanna	Monthly	....	Yes	Electricity	Yes	4 ft.	Electricity	Yes	Electricity
Uniontown	Annually	Open and close	Yes	Kerosene torch	Yes	2½ to 3 ft.	Dug up, used torch	No	....
Rhode Island:									
Woonsocket	Annually	Open and close	Yes	Steam	Yes	5½	Steam and electricity	Yes	Electricity
South Carolina:									
Beaufort	Just started	....	No	....	No	....	....	No	....
Bennettsville	Twice a year	Open and close	No	....	No	....	....	Three	Dug up

For footnote, see page 374.

FREEZING AND THAWING. VALVE INSPECTION (Continued).

City and State.	How often do you inspect street valves?	Of what does such inspection consist?	Trouble with hydrants freezing last winter?	Method of thawing.	Did mains freeze last winter?	At what Depth?	Method of thawing	Did you thaw frozen Services?	Method of thawing.
So. Carolina (Cont.):									
Camden	3 or 4 months	Open and close	No	....	No	....	....	Some	Dig up, blow torch
Darlington	Twice a year	Open and close	No	....	No	....	....	No	....
Florence	Not regularly	Open and close	No	....	Little	1 ft.	....	No	....
South Dakota:									
Aberdeen	Annually	Open and close	No	....	Yes	4 ft.	Water through ¾-in. pipe	Yes	Steam hose
Mitchell	Monthly	Open and close	Two	Lime	No	....	....	No	....
Rapid City	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Watertown	Semi-annually	Open and close	One	Steam	No	....	....	No	Dono by electric co.
Tennessee:									
Clarksville	Annually	Open and close	A little	Wood fire	No	....	....	No	....
Cleveland	Not at all	....	No	....	No	....	....	No	....
Columbia	Twice a year	Open and close	....	....	No	....	....	Yes	Electricity
Greeneville	Monthly	....	No	....	No	....	....	No	....
Memphis	4 times a year	Try them out	No	....	One	3 ft.	Pipe burst	Few	Torch
Murfreesboro	Annually	Open and close	No	....	No	....	....	No	....
Texas:									
Abiline	Annually	Open and close	No	....	Some	....	Built fires	No	Consumers do it
Austin	....	....	No	....	No	....	....	No	....
Brownsville	Twice a year	Open and close, tightness	No	....	No	....	....	No	....
Cleburne	Annually	Examine thoroughly	No	....	No	....	....	No	....
Galveston	Quarterly	Open and close	No	....	No	....	....	No	....
Hillsboro	Annually	Open and close	No	....	No	....	....	No	....
McKinney	Annually	Open and close	One	Used fire	No	....	....	No	....
Plainview	Not regularly	Examine for leak	No	....	No	....	....	No	....
Vernon	Hardly ever	....	No	....	No	....	....	Yes[k]	....
Weatherford	Not regularly	....	No	....	No	....	....	No	....
Utah:									
Salt Lake City	Twice a month	Open and close	No	....	No	....	....	No	....
Vermont:									
Barre	Semi-annually	Open and close	Yes	Hot water or electricity	Yes	4 to 6 ft.	Electricity	Yes	Electricity
Bennington	Annually	Open and close	No	....	Yes	6 ft.	Electricity	Yes	Electricity
Essex Junction	Twice a year	Open and close	No	....	No	....	....	Yes	Hot water through tin pipe
Northfield	....	....	No	....	No	....	....	Yes	Electricity
Richfield	Annually	Open and close	Yes	Dug them up	No	....	....	Yes	Hot water
Rutland	Annually	Open and close	Yes	Steam or electricity	Some	4 to 6 ft.	Electricity	Yes	....
Virginia:									
Charlottesville	Not often	Aqua-phone	Yes	With steamer	Yes	2½ ft.	With steamer	Yes	With steamer
Washington:									
Auburn	Not regularly	....	No	....	No	....	....	No	....
Centralia	Twice a year	Open and close	No	....	No	....	....	....	....
Ellensburg	Monthly	....	No	....	No	....	....	No	....
Palouse	Twice a month	Open and close	No	....	No	....	....	No	....
Port Townsend	Annually	Open and close	....	....	....	....	....	No	....
Pullman	3 or 4 months	Open and close	No	....	No	....	....	No	....
Winlock	Every three months	Open and close	No	....	No	....	....	....	....
West Virginia:									
Fairmont	Twice a year	Defective parts	Some	Electricity	Some	2 ft.[b]	Electricity	Yes	Electricity
Princeton	Twice a year	Examine for leaks	No	....	No	....	....	No	....
Wisconsin:									
Antigo	Annually	....	Yes	Electricity	No	....	....	Yes	Electricity
Baraboo	....	....	No	....	No	....	....	Yes	Electricity
Beaver Dam	Annually	Open and close	No	....	No	....	....	Yes	Small steam boiler
Columbus	Annually	Open and close	No	....	No	....	....	Yes	Electricity
Fond du Lac	Not at all	....	Yes	Gasoline steamer	One	2 ft.	Electricity	Yes	Electricity
Green Bay	Twice a year	Open and close	No	....	No	....	....	Yes	Electricity
Janesville	Annually	Open and close	One	Electricity	One	[l]	Electricity	No	Consumers do it
Milwaukee	16 in. and larger annually	Open and close	A few	Hot water	No	....	....	No	....
Menomonie	Annually	Open and close	Yes	Electricity	Yes	7	Electricity	Yes	Electricity
Shawano	Annually	Open and close	Yes	Steam	No	....	....	No	....
Sparta	Not regularly	....	No	....	No	....	....	No	....
Whitewater	Annually	....	Yes	Electricity	No	....	....	Yes	Electricity
Wyoming:									
Rock Springs	Annually or oftener	Test operation	No	....	No	....	....	No	....
Canada:									
Toronto, Ont.	Annually	Open and close	Yes	Steam	Yes	3½ to 4½	Cut out	Yes	Steam
Winnipeg, Man.	Monthly	Open and close	No	....	Yes	7½	Tap one-inch hole and insert steam hose	Yes	....

[a] 4.5 feet in sand, 4 ft. in heavy soil; [b] at dead ends; [c] hydrants pumped out in late fall and after each using; [d] keep drained and put a little wood-alcohol in them; [e] inspection being organized, will cover tightness, spindle and nut gears; [f] put one quart of salt in each hydrant we thought might freeze; [g] over a culvert; [h] above ground, not properly closed; [i] in meter boxes, including a number of meters; [k] usually too shallow; [l] near a large storm sewer.

[m] Pumped out some to prevent freezing. [n] Steam forced through rubber hose and piece of ¾-in. pipe pushed into the ground over the frozen main.

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Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

NECESSARY WATER WORKS CONSTRUCTION SHOULD CONTINUE.

In all branches of business, both public and private, there is great uncertainty as to what classes of work patriotic citizens are justified in performing and what limitations upon the execution of them will be placed by the authorities at Washington. Among the various official and semi-official utterances that have emanated from the Capitol, the most definite one that has come to our notice is that those classes of public work that are essential to the health and welfare of the people should be continued if possible.

There seems to be little question that an adequate and safe water supply would meet this definition as fully as any other public utility, and that water works officials should consider it obligatory to keep their plants in an effective condition so far as it is in any way possible for them to do so. Pumping equipment must not be permitted to deteriorate to the point where fire protection is inadequate or the quantity of water is reduced below that required for the actual use of the citizens. The filtration plants must be kept sufficient in size and operated at full effectiveness, in order that the quality of the water consumed may in no way imperil the health of the citizens. On the other hand, however, waste of water should be curtailed where its continuance would require enlargement of plants or mains or the consumption of unnecessary amounts of fuel. These ideas are expressed at some length in resolutions adopted by the executive committee of the American Water Works Association and printed elsewhere in this issue.

This work should be done regardless of the expense involved. As to the cost, however, there is question whether improvements that will be needed within the next five years or so can not be performed as cheaply now as at any time within that period. In a paper prepared by Mr. McDonnell (see page 361), he gives reasons for believing that during the period of the war, (which it appears almost certain will last for at least one more year and possibly for several), prices of both labor and materials may go even higher, while after the conclusion of the war they need not be expected to return to those of a few years ago for a number of years, if in fact they ever do. If these conclusions are correct, it would be economy rather than extravagance to construct at once, so far as it is possible to do so, all works which are required for the needs of the present or the immediate future.

We believe, therefore, that it is the duty of water works superintendents this year to carry on all necessary improvements for which it is possible for them to obtain materials and labor.

AMENDMENTS TO THE CONSTITUTION OF THE A. W. W. A.

Probably the most important matter to come before the American Water Works Association at its convention next week is the adoption or rejection of proposed amendments to its constitution. Four changes are suggested by the advisory committee with the approval of the executive committee, these having to do with the qualifications for active membership in the society, the manner of electing officers, that of selecting places for holding the annual convention, and the expenditures of the local sections. The executive committee, in submitting these, apparently considers the second to be the most important of them, but it appears to us that the first amendment is no less so.

The purpose of the first amendment is to admit to active membership not only any officer of a water works, either municipal or private, but also anyone who acts as a technical employee for associate members of the association. These would include mechanical engineers in the employ of manufacturers of valves, hydrants, pumping engines, or other appliances used in water works; engineers, chemists, and bacteriologists employed by manufacturers of filter plants; and any individuals, we believe, who have expert knowledge concerning any materials or appliances used in water works construction or operation. Many of these have special and intimate knowledge concerning such appliances and materials which would undoubtedly qualify them to contribute valuable information to the discussions of papers that are presented before the society. It can hardly be questioned, however, that any information given or statements made by such individuals will be to a greater or less extent influenced by their connection with commercial interests. While they may be perfectly honest and sincere in expressing certain opinions and beliefs, it would be only human nature for them to be influenced by such connections and give greater weight to those arguments that would favor their employers; while they would not be apt to give voice to views which they might hold antagonistic to the interests of their employers. We believe that in the past no difficulty has been experienced by associate members in bringing technical information before the society in the form of discussions and papers, these then being given frankly as the statements of those whose commercial connections may influence them, thus permitting the members to make allowance therefor. It would seem, therefore, that in the matter of information derived by the members from these sources, little if anything would be gained by admitting such individuals to active membership.

The chief change in the status of such technical men would appear to be that of permitting them to vote and hold office; and this, it appears to us, is a matter to be most seriously considered. Other societies have already realized that anything affording a basis for a charge of commercialism in the official doings of a society have tended to lower the standing of the society in the eyes of professional men and also of the public. For instance, as active members, such individuals would have a perfect right to expect appointment on committees dealing with subjects in which they are especially informed; and yet it would probably be out of the question to place on a committee dealing, for example, with the subject of valves, representatives of all the valve companies; and as a result those not so represented might with justice claim that the findings or doings of such committees would presumably be more advantageous to their competitors so represented than to themselves.

Committee reports or conclusions of any kind adopted by the society, with a view to influencing the action of its members and of water works officials generally, would naturally be looked upon with more or less suspicion if it were known that representatives of commercial interests took an active official part in the preparation of such reports.

It is true that a number of engineers and scientific men who wish to join the society and who would be a credit to it, but whose connection with associate members now debars them from active membership, prefer to remain out of the society altogether rather than join as associate members. A few of these it would undoubtedly be to the advantage of the society to have in its membership; but as the amendment would presumably not permit the exclusion of any "civil, mechanical, hydraulic or sanitary engineers, chemists, or bacteriologists . . . employed by associate members of the association" because of such employment, the probability is that scores of individuals coming under this classification would apply for and receive active membership; and for the reasons above stated, we believe that the disadvantages of admitting all of these to full active membership would greatly outweigh the advantages, in their effect upon the standing which the society would have among other associations of technical men, among water works officials and with the public at large.

As to the second amendment, providing for the nominating and electing of members of a nominating committee, which in turn would make nominations for the offices to be filled each year, the procedure seems somewhat elaborate, but it is very possible that it will not prove to be unduly so in practice, and it would appear to overcome some of the features which interfere with the successful working of the existing system. The third amendment would apparently shorten the time required for selecting convention cities by the convention at large. More important, it would be calculated to secure selection based on valid reasons rather than upon persuasiveness of orators. The fourth amendment seeks to clarify the somewhat ambiguous phrasing of an existing article and is not expected to find any opposition.

EFFECT OF WAR CONDITIONS ON WATER WORKS.

The Executive Committee of the American Water Works Association a few days ago adopted a resolution, together with an extensive preamble which, together with an explanatory letter, has been sent to all the members of that association. This originated in the fact that the directors believed the effect of war conditions upon the maintenance and management of water works should be brought to the attention of the members, with the idea that some action be taken (presumably at the convention of the association next week) looking to an effort to obtain such relief as can be furnished by Secretary McAdoo and other government officials.

The resolution began with a series of "whereas's" which really contain the gist of the matter, the resolution itself being merely that they be brought to the attention of the members and through them used for the enlightenment of the public at large. These are as follows:

> Whereas, war-time conditions unavoidably have developed cardinal difficulties in the efficient operation and maintenance of water works properties, both municipally and privately owned, and in some cases the situation and relief of this important public utility has become a subject of grave importance; and
>
> Whereas, the very existence of a modern and civilized community depends upon a pure and adequate supply of water; and
>
> Whereas, the water rates now existing were, as a rule, fixed before the war and were based upon conditions which then prevailed; and
>
> Whereas, reliable information from a representative group of water works shows that the average increase in operating expenses in the past three or four years has amounted to some 40 per cent, and that during the same period the gross revenue of this group of water works has increased but about 7½ per cent; and
>
> Whereas, the increased cost of operation, the difficulty of providing for maturing obligations, and of making necessary extensions to meet the requirements of the Nation's war needs and of expanding industries which water departments and companies share with all other public utilies, are, in the case of water works, intensified by certain conditions peculiar to this service as
>
> (a) A water works can gain no relief by tempoary cessation of service at stated times or in certain areas; there may be moonlight schedules, heatless days and areas, less frequent train service, etc., but water service, from its very nature, must be continuous, both in time and extent. The needs of large industries or war needs cannot be met by diverting from other consumers. A water works must carry its normal load and at the same time take care of its emergency service.
>
> (b) The Nation's war program, including the mobilization of the country's industries, indispensably requires extensions of service by water works. A water works extends its service and enlarges its facilities by increasing its pumping and purification equipment and by laying additional pipe. In such extensions iron products constitute the chief element, which products have increased in price enormously and probably more than any other commodity in general use.
>
> Since 1915, iron pipe has increased in cost 150 per cent, and pumping machinery and filtration equipment from 100 per cent to 200 per cent.
>
> Since there can be no enlargement and extension of industries to meet war needs without increased and extended water service, water works are powerless to avoid expenditures for this purpose and unable to escape the payment of such vastly increased prices.
>
> (c) The greatly increased cost of operation, which affects all public utilities, seriously affects water departments and companies, in particular, for the reason that the largest single item of expense in the operation of water works is fuel. In normal times fuel constituted about 15 per cent of the total cost of operation. Now fuel cost is approximately 30 per cent of the total cost of operation. In addition to this, the cost of water purification has increased more than 40 per cent and cost of distribution more than 20 per cent of the normal cost of operation; and
>
> Whereas, the general public, and in fact many State and municipal officials, appear not to visualize clearly that even properly imposed increases in the cost of labor and essential materials must of necessity likewise increase the difficulties and cost of managing water works properties efficiently; and
>
> Whereas, considerations of equity and the vital necessity of maintaining continuous and adequate service require that the water consumer bear his proportionate share of such necessary increase in expense that water departments, whether municipally or corporately operated, should not be forced to operate at a loss or be deprived of the reason-

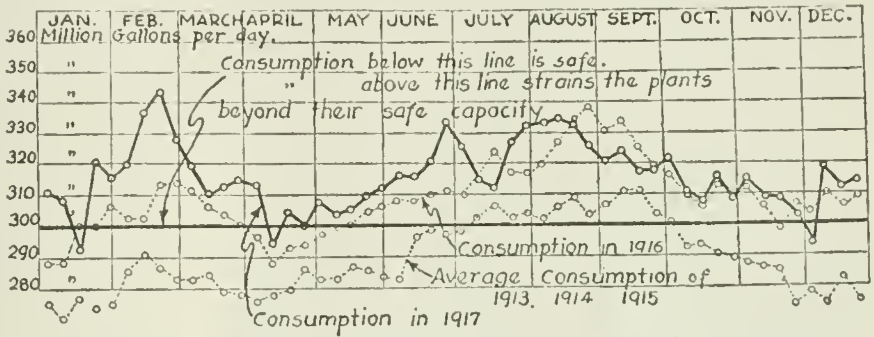
able return on their business, necessary to command capital, upon advantageous terms, for required extension and betterment of the service; and

Whereas, in time of war it is vitally essential that so far as is consistently possible it is necessary to conserve the health and well being of the public, and to guard against fire losses, by providing pure and adequate water service to the public, and to the industries, particularly those engaged in the manufacture of war materials; and

Whereas, without an equitable balance between the cost of operation and management of water works and the revenue received from service it is inevitable that the maintenance in a satisfactory manner of this vitally important essential must of necessity deteriorate.

WATER WASTE IN PHILADELPHIA

The safe capacity of Philadelphia's pumping plant is 300,000,000 gallons a day. The diagram shows to what extent this capacity was exceeded in 1917 and the four years previous. Chief Carleton E. Davis estimates that at least 85,500,000 gallons a day are wasted. For twenty-five years the chiefs of the Philadelphia Bureau of Water have been striving to get the city council to permit them to take effective steps to stop this waste, but in vain. If a break-down of the overtaxed plants should cause a water famine the voters of the most politics-ridden city in the country will have themselves to blame; the water bureau will be absolved from all blame by those who know the facts of the case.



WATER RATES AT NIAGARA FALLS.

Like many other places in the country, we believe, Niagara Falls, N. Y., is finding it necessary to meet increased demands upon its plant in spite of war prices and other conditions. In a report made a few days ago by O. E. Carr, city manager, to the City Council, he stated that the plant of that city is now being operated very close to its maximum rated capacity; so close, in fact, that extension of its business is impossible and there is not enough margin of safety for the unusual service which a fire may demand at any time. The pumpage during 1917 was 26 per cent greater than during 1916, and if a similar growth is experienced this year, provision must be made for increased pumpage.

Under ordinary conditions, the natural solution would be to increase the capacity. At present, however, the cost of this would be high and it might even be impossible to obtain the machinery for months, if at all. Mr. Shepard, the superintendent of the Bureau of Water, estimates that domestic users of water on the flat-rate basis wasted an average of one-half million gallons each during the past year, the total waste having been about 2½ billion gallons. If even an appreciable portion of this waste could be eliminated, the present capacity of the plant would be adequate for some time.

Mr. Carr therefore recommends that every effort be made to curtail the waste. A completely metered system is, in his opinion, the desirable plan for selling water, and he recommends that meters be required on all new services, and that all consumers who use city water for hopper closets, beer pumps, power washers and public garages be metered. The city would install all meters for domestic consumers and require them to pay for them, in quarterly installments in case easy payments are desired. Also, he would have it made the duty of any employee of the Bureau of Water to report any leaking, defective fixtures or any waste of water; and the superintendent of the Bureau should be given full power and authority to direct consumers in whose buildings such leaks or defects are found to install meters.

He also proposes that the flat rates be increased by 25 per cent, bills to be paid semi-annually in advance with 10 per cent discount if paid within ten days from the date of the bill (these latter being the conditions now in force). He also recommends revision of the meter rates so as to reduce by 1-1/3c per thousand gallons the charge to the smallest consumers and increase by 1c the charge to the largest consumers; the rates proposed ranging from 8c per 100 cu. ft. for less than 20,000 cu. ft. per quarter, to 3c per 100 cu. ft. for over 250,000 cu. ft. per quarter. A minimum meter rate of $1.50 per quarter is recommended. Mr. Shepard estimates that the revised meter schedule would give practically the same total income as is now derived from meter rates. As the flat rates are being increased by 25 per cent, this would serve to encourage the use of meters.

EXPERIENCED ENGINEERS WANTED.

Under the scheme of organization for the maintenance and operation of the cantonments and camps, a major takes entire charge and from four to six captains are placed in charge of the various utilities such as electric lighting, water supply, road construction, steam heating plants, building repairs, etc. In addition, there are a number of lieutenants. These officers are required to organize and control forces ranging from 240 men in a National Guard tented camp, to 700 men in a National Army cantonment where there are a number of regimental steam heating plants, beside a large central steam heating plant at the base hospital which in most cases has a capacity of 1,500 beds.

Philander Betts, Lieut. Col. Q. M. C. N. A., has expressed the desire of obtaining the names of a number of men who can be commissioned as majors, captains and lieutenants and assigned to duty at the various camps in connection with the maintenance and operation of these utilities. It is desired to obtain men above the draft age and those who, in addition to their technical knowledge, are capable of team work and working under discouraging conditions.

Any who feel that they meet these qualifications, or who know of technical men who probably would meet them, are requested to communicate with Lieutenant-Colonel Philander Betts, Construction Division, 7th & B Streets, S. W., Washington, D. C.

WATER WORKS OPERATION STATISTICS.

(Continued from page 365)

its use so almost universal as is shown by the table. According to the replies received, a great majority of the cities used electricity last year for thawing frozen services, and almost as large a percentage used it for thawing mains.

We hope to give in future issues considerable detailed information concerning the methods employed by the various cities, especially where these were at all out of the ordinary.

The WEEK'S NEWS

Roadbuilders Aid Oregon Farmers—Road Work for War Prisoners—Pennsylvania to Skip Good Roads Day This Year—Louisiana Health Officials Confer—Insanitary Schoolrooms in Philadelphia—City Wins in Impounded Funds Case in San Francisco—Suspend "Lightless Nights"—Canadian Government Controls Power—Police Regulations in Indianapolis—New York Firemen Sell Liberty Bonds—Government to Prevent Munitions Fires—St. Paul's Retrenchment Policy—Car Fares in Cleveland—Zone System for Rhode Island Fares.

ROADS AND PAVEMENTS

Federal Aid for Roads Used by Army.

Washington, D. C.—Representative Cooper, of Ohio, has introduced a bill appropriating $10,000,000 to aid the various states in the repair and reconstruction of highways that are being badly cut up by the extensive use of military motor trucks.

Road Builders Stop to Help Farmers.

Salem, Ore.—The Warren Construction Company and Calvert & Wolke, contractors on state highway work in Douglas county, have agreed to suspend work in that county for three weeks so that farmers may have an opportunity to use the men and teams that have been employed on the roads. At the request of B. L. Eddy, representing the farmers, the state highway commission put the situation up to the contractors, who readily agreed to the suspension. They are credited with patriotic motives by the department, the contracts containing no clause providing for suspension of the work. The farmers of Douglas county are much in need of teams to put in the spring crops. Applications for use of men, teams and equipment will be received from the farmers by a representative of the highway department and Mr. Eddy, of Roseburg, and the necessary arrangements will be made with the contractors.

War Prisoners to Work on Roads.

Washington, D. C.—The war department has decided to make the German prisoners of war now held in this country earn their keep. Orders have been sent to the army officers commanding the enemy prison camps at Forts McPherson and Oglethorpe, Ga., authorizing them to utilize the labor of the 1,370 inmates in completing a new system of roads about the posts. These prisoners were taken from German raiders. Under the regulations for the control of prisoners promulgated by the secretary of war, the adjutant general of the army has authority to establish the rate of wages to be paid for the labor of prisoners. It is expected that a sum representing 25 or 30 cents a day over and above the maintenance of each prisoner will be fixed. Each man's earnings will be placed to his credit at the camp exchange to be used in purchasing small necessities not included in the equipment furnished by the government. Prisoners are forbidden to have the actual cash in their possession. The proposal that interned aliens also be put to work has been taken under consideration. Under international law they cannot be forced to work except at such labor as is necessary to keep their place of internment in a sanitary condition. It is expected that an opportunity will be given to these prisoners to volunteer for other work at a fair rate of compensation.

No Good Roads Day in Pennsylvania.

Harrisburg, Pa.—A proclamation informing the people that because of the war there would be no "good roads" day in Pennsylvania this year has been issued by Governor Brumbaugh. Instead of working as volunteers on the highways the Governor suggests that all men and women devote their time to gardening in order to increase foodstuffs. The Governor says in part: "Whereas, Hon. J. Denny O'Neil, highway commissioner of Pennsylvania, already has with my approval arranged to turn the forces from the highways to the farms to help grow food for our army and navy and for our allies, thus evidencing a praiseworthy and patriotic purpose to aid the farmers of the State; Now, therefore, I, Martin G. Brumbaugh, Governor of the Commonwealth of Pennsylvania, do hereby announce that no good roads day will be observed in Pennsylvania this year, and instead thereof I call upon and urge all our people to go to the soil and in every way that wise counsel, honest toil or transportation of workers can do so, help increase the output of foodstuffs. It is a most vital and patriotic duty. It is to be regretted that our laws do not give me power to collect all loafers, rich and poor alike, and compel them for defined periods to work for the nation in this crisis."

SEWERAGE AND SANITATION

Borough Appeals Against Sewerage Rate Increase.

Collingswood, N. J.—The borough of Collingswood filed in the supreme court at Trenton its appeal to the court of errors to review the judgment of the lower tribunal in permitting a rate increase by the Collingswood Sewerage Company in excess of the franchise agreement with the borough. The state public utility commission refused to sanction the increase, but the supreme court reversed this finding. Several reasons were assigned by the borough in its appeals, together with the charge that the decision of the supreme court is illegal, oppressive and unjust. Counsel for the borough contends that the utility board is without jurisdiction either to increase rates or grant permission to file a new schedule of rates beyond the maximum provided in the ordinance, and also that the board has no power to fix rates without regard to the ordinances and contracts of the municipality. It is further contended that the borough was expressly authorized by statute to fix the maximum rates to be charged for service and that the acceptance of the franchises concluded a contract between the municipality and the company, which the utility board has no power to set aside. That the Legislature, under an act of 1911, granted to Collingswood power to fix the rates to be exacted by the company by irrepealable contract is another contention made by the borough. Several other reasons are presented, including the contention that permission given the company to use the streets and public places in the borough was granted by an ordinance authorized by law and that the rates fixed under this ordinance are just and reasonable and enable the company to maintain its property and equipment in proper condition.

Complying with the recent surprising decision of the state supreme court holding in effect that franchise contracts between municipalities and public utility companies, specifying fixed rates for service by utility as a consideration for franchise rights, are mere scraps of paper, to be voided without the consent of the municipality, the New Jersey Public Utility Commission issued orders empowering the Collingswood Sewerage Company and the Burlington Sewerage Company to put increased rates into effect. In the case of the Collingswood company, the board approved in substance the rates proposed by the company. The board, however, ordered some slight modifications in the schedule offered by the company, these being small decreases. The schedule proposed by the Burlington company was approved in its entirety, though the board recommended that the company make a careful study and canvass with a view to ascertaining whether or not the company would receive a large actual income by lowering the minimum rate to $8 or $9, rather than by insisting on the payment of a $10 minimum with its probable loss of patronage. "It is," said the board on this point, "a fact well established in respect to public utilities that an increase, for instance, of twenty-five per cent in rates, will cause a loss of ten or fifteen per cent of the attached customers, who refuse to pay the increase, and that a larger increase in rates will cause a corresponding decrease in the number of attached customers. This is a practical operating question and can only be solved by a careful study and canvass of the question involved." The new rates will continue as long as the supreme court opinion is the law of the state, which will be until it is upset by the higher court. If it is not upset in the pending appeal litigation, the increased rates, which are contrary to the franchise agreements between Collingswood and Burlington and the sewerage companies operating in these two municipalities, will become permanent. The utility commission originally refused the applications of the sewerage companies for increased rates on the ground that rates specified in the franchise agreements could not be abrogated without the consent of the municipalities involved, which consent was not had in either of these cases. That reasoning was pronounced unsound by the supreme court, and the radical decision has attracted widespread attention to New Jersey because of the great advantage given to utility companies under it. It was this "scrap of paper" decision by the supreme court that led George L. Record to ask Governor Edge to call a special session of the Legislature to have the utility law so amended as to clearly express the intent of the Legislature that franchise agreements between municipalities and utilities are to be considered irrepealable contracts, and not to be set aside by any agency of the state government without the consent of the municipality involved. Governor Edge declined to call a special session mainly because of the appeal now in the Court of Errors and Appeals. The rates asked for by the Collingswood company will add $25,600 to its annual revenue. The rates asked for by the Burlington company will produce annual additional revenue of $16,615. The new rates affect all classes of sewer service in Collingswood and Burlington. In each case the utility commission finds that the new rates are necessary if these companies are to earn a proper return upon investment.

State Department Meets Local Health Officers.

New Orleans, La.—About sixty parish and municipal health officers met here recently in response to the invitation of president Dowling, of the state health board, to consider improvements in sanitation and health conditions of the state. Dr. Dowling opened the convention with an address in which he emphasized the necessity of reorganization of the state health forces. Addresses followed by Dr. R. C. Devereaux and Dr. Jacob B. Geiger of the United States Public Health Service. Dr. Devereaux outlined a plan for financing a state association of doctors for the betterment of health conditions.

Health Department Finds 1,500 Insanitary Schoolrooms.

Philadelphia, Pa.—There are 1,500 classrooms in the Philadelphia school system which are insanitary and prejudicial to the health and safety of the pupils, according to the results of a medical survey of the buildings just completed by the department of public health and charities. More than 400 classrooms, the report charges, have not sufficient air per pupil; the ventilation facilities are poor or worse in the same number of rooms; the children in 500 rooms are without adequate light, on account of lack of window space; about 350 classrooms are badly overcrowded; in about forty buildings the toilet sanitation is harmful to health; the drinking-water accommodations in about ten schools do not measure up to the health standards; in the same number of schools the exits are inadequate; in three schools the fire escapes do not meet the modern demands, and in about sixty schools proper playground facilities are lacking. The points taken into consideration in grading the schools are ventilation, natural and artificial illumination, desk space, overcrowding of a classroom, toilet conditions, playground facilities, drinking water accommodations, wardrobe provisions and others. These conditions are caused primarily, it is believed, through the fact that the school plants include a large number of old buildings, which cannot readily be made to fit the modern health standards. The report indicates that the board of education has not made any efforts to eliminate many of the most objectionable features mentioned in former surveys. Among the schools about which the taxpayers have frequently complained is the Rutledge School, at Seventh and Norris streets. This building was erected during the Civil War. One of the most flagrant cases brought to light by the survey is the Rutledge Annex II, on Ninth street above Montgomery avenue. The entire school is rated "bad," which, according to the translation of the health authorities, means that it is prejudicial to health. The teachers' dressing room and toilet accommodations are "very bad" in this building. One small room is used as a dressing room and a kitchen. It contains a toilet, not partitioned off from the remainder of the room. This condition is unlawful.

WATER SUPPLY

Water Company Allows Higher Rates.

Terre Haute, Ind.—As a result of the action of the public service commission's decision, the case of the Terre Haute Water Works company in which that utility asked for an increase in water rates, 59 per cent of local consumers will pay 75 cents per month for their water instead of 60 cents, the rate last year. Nearly three-fifths of the entire list of customers of the Terre Haute Water Works Company will be required to pay one-half a cent per day more than they paid last year. "As nearly as I can figure it out we will get just 63 per cent of the increase asked for," said general manager Dow R. Gwynne. "That means we are granted 37 per cent less than the irreducible minimum, the least we figured we could get along with. For the larger consumers there is a greater increase in rates per consumer and to a few using water in larger quantities it means a difference of $30 per month per consumer. We asked for an advance of $10 from last year's rate of $40 on fire department hydrants, and the commission split the difference with us, granting an increase to $45." Following are the new rates for water, effective May 1:

For first 20,000 gallons per month, 22½c per 1,000 gallons.
For next 80,000 gallons per month, 20c per 1,000 gallons.
For next 200,000 gallons per month, 12c per 1,000 gallons.
For next 700,000 gallons per month, 7c per 1,000 gallons.
For next 1,000,000 gallons per month, 6c per 1,000 gallons.
For all over 2,000,000 gallons per month, 5c per 1,000 gallons.
With minimum monthly charges as follows:
Five-eighths inch meter, 75c.
Three-quarter inch meter, $1.
One-inch meter, $2; with fire protection, $3.
Two-inch meter, $5; with fire protection, $7.50.
Three-inch meter, $7.50; with fire protection, $11.25.
Four-inch meter, $10; with fire protection, $15.
Six-inch meter, $40; with fire protection, $60.
Eight-inch meter, $80; with fire protection, $120.

A penalty of 10 per cent will be added to all bills not paid within ten days after the same are due.

For each fire hydrant, per annum, $45.

Said fire hydrant service to include water for flushing sewers.

City Collects Taxes on Impounded Money.

San Francisco, Cal.—The Spring Valley Water Company has finally lost in its attempt to prevent San Francisco from collecting $227,496.95 taxes on the money impounded in rate suits pending in the Federal courts, the United States Supreme Court having handed down a decision sustaining the order directing payment of these taxes. If the city had lost in this suit it would have meant that a quarter of a million dollars which had been collected in taxes would have had to be paid back into the impounded fund. While the principal of the impounded money is $2,063,134.59 and the full amount, together with accumulated interest, is $2,281,595, there has been invested in Liberty bonds the sum of $2,000,000, so that the amount remaining upon which the city may collect taxes in the coming fiscal year is comparatively small. Assessor John Ginty estimates that the tax yield from the balance to the city in the fiscal year

1918-19 will be in the neighborhood of $3,600. The city's most important victory is in escaping from the necessity of refunding the taxes it had collected on the impounded money in the last four years. The case was begun against the city in the name of the six San Francisco banks, with which the money had been deposited by the Federal custodian. It was argued recently before the United States Supreme Court for the city by assistant city attorney Robert M. Searls. The money began to be impounded in 1908, when Judge Farrington granted a tentative 15 per cent increase in the rates, but owing to postponements granted the city, the cases have not yet been finally decided. Master Wright's decision, if it were to become final, would hand this money over to the water company in full. The 15 per cent difference between the ordinance rate and the Farrington decision, ceased to be impounded two years ago, when the Supervisors granted the water company a 15 per cent increase in the ordinance rate, on the company promising to furnish water to certain districts and when its vice-president said the company would endeavor to put in permanent pipes in advance of permanent street work. Since that time, however, miles of bituminous pavements have been put down over temporary two-inch pipes.

Enjoiner of Plant Construction Must Pay Damages.

Great Falls, Mont.—A verdict has been returned in favor of the city in the action brought against Joseph McClintock for damages which the city sustained while McClintock had the construction of the filtration plant tied up under injunctional proceedings last year. The amount of damages which the jury awarded the city against McClintock is $250, while a verdict of $150 was returned in favor of Olson & Johnson, the contractors. A. J. Fousek as mayor of the city also shared in the verdict as did William H. Harrison, the city clerk, but these city officials were made beneficiaries in the sum of only $1 each. Both the district and supreme courts had ruled against McClintock's attempt to restrain the city from proceeding with this construction work, and after the case had been won in the higher court damages were sought through McClintock's bond for the losses sustained all parties concerned while the court proceedings were pending.

STREET LIGHTING AND POWER

"Lightless Night" Suspended.

Washington, D. C.—The United States Fuel Administrator, Dr. Garfield, has ordered all state fuel administrators to suspend from April 25 until Sept. 1 the lightless night order which went into effect last November, when unnecessary street and sign lighting was prohibited on Thursday and Sunday nights of each week. The order states: "At the urgent request of the Liberty loan committee I have decided to suspend operation of the lightless night order. By reason of the late hour of lighting brought about by the daylight saving law the lightless night order will remain suspended until Sept. 1 next, when it will again become effective."

To Require Deposits on Extensions.

Springfield, Ill.—The Springfield Gas & Electric Company will not be allowed to refuse to make connections of gas mains and electric wiring for new customers during the period of the war, as it asked from the state public utilities commission, claiming the high cost of material and labor. The commission has issued an order requiring the company to continue to make the connections in question, but also allows the utilities company to require the prospective customers to deposit with the company the amount it costs to make the required extension. However, the commission provides that the company shall refund this money to the customer in amounts of not less than 25 per cent monthly and pay 5 per cent per annum interest on the deposits under certain conditions laid down in the order. A petition has been filed by the city of Springfield with the state public utilities commission, asking the commission to conduct an investigation as to the relative expenses borne by the electric light department and the steam and hot water heating departments of the Springfield Gas & Electric Company's power-house at 10th street and Capitol avenue. This action grows out of the Springfield Gas & Electric Company filing a petition with the state public utilities commission, asking for authority to increase the rates for steam and hot water heating service. It is believed by the city that the company, at the hearing now in progress before the state public utilities commission, is seeking to throw the burden of the expense of the heating department in order to secure an increase in rates.

Government Control in Canadian Power Shortage.

Montreal, Canada.—A number of factories producing munitions which depend on electric power generated at Niagara Falls have recently been handicapped by a grave power shortage estimated at 21,000 hp. In view of the serious condition, the Canadian Government has issued an order in council providing for the pooling and distribution of all power resources. The distribution will be directed by Sir Henry Drayton, controller of electric energy, regardless of existing contracts, and priority will be given to munition plants. Power companies which have steam generating plants are ordered to operate them at full capacity. It is expected that the execution of the order will make up the deficiency in the power supply.

FIRE AND POLICE

Two Firemen Hurt.

San Francisco, Cal.—Two firemen were seriously burned, many others narrowly escaped and at least $200,000 damage was done by a fire which wiped out three floors of the Merritt building. For a time the entire six-story building was threatened. The injured are captain Eugene Reardon and Louis de Martini. Thirty workers on lower floors of the building fled to the street down fire-escapes. The fire may have started in an X-ray machine factory when inflammable material dropped on the laboratory floor. The fire spread to the rooms of the California Electrical Company and then to the offices of the Railroad Supply Company.

New Regulations for Policemen.

Indianapolis, Ind.—Important changes in the policy of the Indianapolis police department were recently announced in a general order containing twenty-one rules governing the conduct of policemen in the discharge of their duties, issued by George V. Coffin, chief of police. The first rule stipulates that policemen are prohibited from discussing politics while in the discharge of their duty. This is a marked deviation from the policy of the department in the former administration, during which, it was shown, politics was the controlling factor and did more than any one thing to disorganize the department. One of the most important changes in the policy of the department is brought about by the rule which instructs policemen that they are not to arrest minors for misdemeanors. Instead of arresting the boy or a girl for some minor offense, as has been done in the past, the policemen are instructed to get permission from the captain in charge to take the child to its parents or guardian and explain the case. They are also instructed to inform the parents or guardian that a second offense will result in charges being fled in the juvenile court against the parent or guardian and the minor. This system it is the belief of chief Coffin, will place more responsibility on the parents or guardian of minors and at the same time will prevent a court record being made against first offenders, who are only guilty of misdemeanors. Another rule which will enable the members of the department to give an additional service to the public is the one which directs the district patrolman to make immediate reports of all street and sidewalk obstructions, all defects therein from which accidents may occur, and remove them when practicable; all places for which temporary permits are granted for building or where openings or excavations are being made and see that suitable precautions are provided for public travel; all coal holes left exposed or insecure; all street lamps out of repair or not lighted at proper time or too early extinguished or any other place where dangerous or unwholesome trade is carried on; all nuisances and other matters affecting the safety and convenience of the public, or the interests of the city, including a report of all accidents or personal injury out of which suit against the city may arise. One of the rules cautions the men about the use of their revolvers and clubs and stipulates that such weapons are to be used only in case of self-defense or of violent resistance. The free use of clubs by some policemen during the former administration was one of the acts that brought much condemnation from the public. The issuance of the order marks the resumption of the daily bulletin system, at one time in vogue at police headquarters. This system proved an effective way of keeping the policemen informed as to the rules which they are expected to obey, as well as giving them information regarding the various happenings in their districts. Other rules are:

12. The receiving or accepting of any fee, reward or gift of any kind from any person arrested, or from any friend in his behalf while in his custody or after his discharge, or from any person, is prohibited.

13. Turnkeys and matrons must not solicit for attorneys or bondsmen.

14. Officers must not accept cigars or cigarettes from saloons or poolroom keepers, or gifts or loans from any source or class of people whatever.

16. All blind musicians and other mendicants are to be kept off the streets. These people will be cared for by the Charity Organization Society.

18. Officers will remove vehicles and all unnecessary obstructions from all streets and alleys.

19. When making regular calls over the police call boxes, the officers must keep the box open for five minutes so that the operator may talk to them if they are wanted.

20. All members of the department are prohibited from sitting down in crowded street cars. The citizens pay their fare and are entitled to their seats.

21. When an alarm of fire is given the patrolmen on a district and the next surrounding the one from which the alarm is turned on will hasten forthwith to the scene of the fire, and in case the fire should prove one of magnitude, they will call the captain.

Firemen Spectacular Liberty Bond Salesmen.

New York, N. Y.—April 29 was Firemen's Day in the Third Liberty Loan drive, and men with the apparatus collected about $1,000,000 in the streets. Without luncheon and supperless, they worked from early morning until late at night, and they showed New York some startling new wrinkles in the art of arousing patriotism and realizing therefrom. The most spectacular and most popular thing the firemen did was accomplished by means of a huge fire truck and a squad of active persuasive firemen. The ladder was raised to a height of about seventy-five feet, each rung representing a $50 bond. A fireman then mounted the ladder slowly as the subscriptions came in, a rung for each $50 collected by his comrades. When he got to the top, the $5,000 round, his arrival was greeted with due and appropriate ceremony and, then the whole performance was gone over again. Five different trucks started at 9 o'clock in the morning to canvass the city. The trucks and their crews covered every district in Manhattan from the Battery to the Harlem River. The firemen who accompanied the trucks gave up their day off to do so. At the Sub-Treasury at noon the crowd, gathered there to hear the usual speaking program which the Liberty Loan Committee has maintained since the drive started, hardly knew what to expect when the big truck and its accompanying red automobile, with a band, drew up in front. They cheered a little, however, and waited. In a few minutes the firemen riding on the truck had disappeared in the crowd, all except a man with a megaphone and several men who began to slowly send the towering ladder toward the sky. A second or two of stillness, and then the crowd cheered again. On the ladder were signs, $500, $1,000, and so on, and at the top was the mark $5,000. A fireman stood at the foot. Captain Luke Flannigan of Engine Company 33 then made a short speech explaining that the fire department wanted the help of New York city to send its men "over the top" for the loan. A cheer followed that echoed through Wall street, and immediately thousands of bankers and brokers began to vie with each other to send fireman Owen Ryan, the man on the ladder, "over the top." Ryan mounted steadily, and as he got near the top the crowd became quiet again, waiting. Suddenly he stepped on the top rung and whipped out a flag, waving it triumphantly, while a siren on the truck resounded its peal of victory. The crowd went wild, and Ryan was kept going up and down the ladder until he grew tired and his place was taken by a substitute.

Government to Prevent Munitions Fires.

Washington, D. C.—To minimize the possibilities of fires in munitions plants and all factories engaged on war work, the War Industries Board has created a fire protection section which will maintain a close inspection of all plants engaged on government work. It will be assisted by the intelligence bureaus of the army and navy and all local and district fire inspection services in the country, where circumstances warrant it will enlist the aid of the fire marshals of the various states and ask the cooperation of insurance underwriters. There have been many disastrous fires in war factories and grain elevators both before and since the United States entered the war. In the fires millions of dollars' worth of munitions and grains needed by the government and the allies were destroyed. According to an official statement, the fire prevention section is not intended to disturb existing agencies that are performing satisfactory inspection service; the first efforts will be directed to the improvement of conditions in the large number of improvised factories that have been started because of war work. The aid of municipal and state fire marshals will be enlisted. An earnest effort will be made to prevent duplication of inspection on the part of either government or insurance agencies, and also to coordinate all activities of the government so far as they relate to this work. The section's executive committee consists of the following: W. H. Merrill, chicago, president of the Underwriters' Laboratories, chairman; W. E. Mallalieu, New York, general manager of the National Board of Fire Underwriters, and Frank L. Pierce, Providence, R. I., president of the "What Cheer," and "Hope" Mutual Fire Insurance companies.

GOVERNMENT AND FINANCE

Expense in Getting Franchise Allowed as Capital.

Dallas, Tex.—The Dallas Railway and the Dallas Power and Light Companies have been allowed $100,000 each by the mayor and commissioners as additional capital value for "reasonable" expenses incurred in obtaining the franchises under which they now are operating. The companies originally asked for an additional valuation of $300,000, but the mayor and commissioners eliminated the expense items covering the straw vote, all advertising and other election expenses, hiring of halls, bands, etc. This involved a cut of $100,000 in the amount asked for, but, according to commissioner Winfrey, the list was gone over carefully and the amount decided on represents "every penny expended by the companies properly" for reorganization. Mayor Lawther said that the items recognized in the $200,000 total cover lawyers' fees, engineering expenses, accountants' fees and traveling expenses chiefly. "The big rub came in when we attempted to separate what was expended in 'acquiring property' and in 'financing it'," the mayor said. Commissioiner Doran's recommendation said: "I find that the negotiations were so extended and complicated, and the expenditures so varied, that it was impossible to positively segregate the money expended for the different purposes. I therefore moved that the board allow $100,000 as additional capital value to each of the properties as a reasonable amount for the purposes hereinbefore set out; said addition to property value to be added as of Nov. 21, 1917, shall reimburse the working capital of the respective companies in the amount of $17,660.08, this amount having been paid out of the working capitals for certain of the organization expenses herein allowed. While I am convinced that the present owners of these properties spent sums far in excess of the above amounts, I feel that $200,000 is as much as we can, after careful consideration, positively identify as having been spent for the purposes authorized and set out in the franchises."

Not to Discharge Employes in Reducing Improvements.

St. Paul, Minn.—Reduction of public improvement work in St. Paul this summer is expected to result in 1,500 men formerly employed in municipal activities being available for war work, commissioner Goss estimated. Street paving, grading, sewer construction and similar activities planned for this year would have required 2,000 men to complete. With the work postponed until after the war, only 500 men will be necessary to complete projects now under construction. The department of public works, the department of finance, the purchasing department and the department of public buildings will have their work reduced because of the war. This will not mean, however, that employes of these departments will be let go. Rather a system of leaving vacancies open will be adopted. "When men leave my department to enter war work, I do not fill their positions," Goss explained. "Also normal vacancies are not filled. This maintains those who need support and at the same time put my office on a war basis." Large contractors will feel the lack of city jobs. Among the firms which will be affected are Fielding & Shepley, Thornton Bros., O'Neil & Preston and E. T. Webster. They, however, are expected to be kept busy this year on unfinished work. Work on preparing orders, figures and estimates for new work will not stop. This will move right along, although on a lessened scale. The object will be to have a large amount of work ready to be started when the war ends. "If we have contracts all ready to let when the war ends," Goss explained, "it may aid prosperity in St. Paul tremendously. We will be ready to do our share towards spreading prosperity when the boys come home."

TRAFFIC AND TRANSPORTATION

Cleveland's Fares at High Limit.

Cleveland, O.—The Cleveland Railway is now collecting the highest rate of fare allowed under the so-called Tayler grant. The rate is 4 cents cash and seven tickets for a quarter, with a 1-cent charge for transfers and no rebate. The only difference between this rate and the one used during the previous week is the retention of the money received for transfers. Officials of the Cleveland Railway said that experience of a week with the next lower rate showed that it produced less income than the one discarded before that time. This was six tickets for 20 cents and 1 cent for a transfer with no rebate. J. J. Stanley, president of the company, declared in favor of an advance to the maximum when the first of the recent changes was made, but the company was met by an injunction in Common Pleas Court. This restraining order was dissolved by the Court of Appeals. It is said by some that even the highest rate provided by the franchise will not be sufficient to pay operating expenses and dividends and that the city council will finally be asked to amend the franchise to allow an increase in fares commensurate with the growing cost of operation. The increase just made will yield additional revenue of about $600,000 a year, but much of the additional funds will probably be absorbed in the wage adjustment in effect on May 1.

Legislature Approves Zone Fare System.

Providence, R. I.—The zone system of transportation charges for street railways for the lines of the Rhode Island Company has been finally approved by the state senate by the close vote of eighteen to seventeen. The plan already had passed the house. The new system went into effect on May 1. The action of the senate closes a controversy of more than a year in the Legislature, and one of two years before the city council. In its requests to the council the company said that it was facing bankruptcy and needed financial relief. The company asked that its franchise tax be reduced and that it be relieved from the obligation to pave certain streets. The city refused to extend any aid. A year ago the company went to the Assembly for relief. On the last day of the session a bill was passed appointing a special commission of three to determine an adequate fare system and to report to the Public Utilities Commission what it thought a good plan. The bill specifically ordered the Public Utilities Commission to follow the instructions of the special board. A report recommending among other things a zone system was handed in. The Public Utilities Commission, as ordered under the law, told the Rhode Island Company to put the zone system into effect on April 1. Then the Assembly suddenly appealed the law of a year ago and specifically ordered that there be no change in fares until the Assembly said so. The Assembly then named three Senators and four Representatives as a special committee to investigate the subject and look over the special report on the zone plan. This committee brought in a majority report favoring a 6-cent fare with eighteen tickets for $1. There were two minority reports, one for the zone system signed by one man and another for State ownership signed by one man. After debate, the minority report favoring zones was substituted for the majority report, and the act then passed. The zone system provides for a 5-cent zone in Providence, another at Pawtucket, one at Woonsocket, one at East Providence and one at Riverpoint in the Pawtucket Valley. Beyond these the territory is divided into so-called 2-cent zones. A 5-cent fare is a minimum charge anywhere, however. The transfer privilege in a 5-cent zone is extended to every patron riding into that zone. It is estimated by the company and the commission that the new plan will increase the gross income of the company about $500,000 each year.

MISCELLANEOUS

Government Nitrate Plant in Ohio.

Washington, D. C.—The War Department has announced that after careful consideration, it has been decided to locate nitrate plant No. 3, which will be composed of two units (3a and 3b) as follows: Plant 3a at Toledo, Ohio; plant 3b at Elizabethtown, Ohio. These two half units will equal, in capacity of production, the full unit now under construction in Sheffield, Ala., and known as plant No. 2.

Trade Board Organizes Housing Construction.

Flint, Mich.—The rapidly increasing expansion in industry in this city, and the consequent growth of population, last year resulted in the development of a grave housing scarcity. Recognizing this, the Flint Board of Trade organized a subsidiary, the Civic Building Company, to take active control of the situation. A survey was first made which showed that vacant parcels of land within the city boundaries were being held for speculative prices. The Civic Building Company, to escape high ground costs, bought a tract of 400 acres just outside the city and developed it according to plans prepared by Davis, McGrath and Kiesling, architects, New York City. The exterior treatment of the house is generally of the old New England village type with simple roof lines, close eaves and small pane windows. In ornamentation a touch of lattice work is introduced wherever desirable to modify large vacant spaces, and flower boxes are freely used on the sides of porches and under windows. Considerable attention has been paid to the grouping of houses by blocks through the harmonizing of a material and color scheme. The houses are set back from 10 to 20 feet and by grouping at different distances from the street line pleasing effects have been produced. The whole tract was put in the hands of William Pitkin, Jr., landscape architect, Rochester, with instructions to so arrange as to make the tract an integral part of the future city of Flint. A 22-acre woodland tract was reserved for park purposes, free sites for library, churches, amusement building and schools are provided. Two blocks were reserved for business buildings, and about 1,500 lots for houses were laid out, the minimum size of the residence being 50x100 feet. Work on 200 houses were begun last fall and continued through the winter months. The houses will contain from five to eight rooms each, and to range in cost from $1,500 to $2,000. Bathroom, hot-air furnace, drainage system and other modern improvements are provided.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

May 7-9.—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting, Chicago, Ill. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

May 7-10.—CANADIAN GOOD ROADS ASSOCIATION. Annual road congress. Secretary, George A. McNamee, 909 New Birks Bldg., Montreal, Que.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 14.—AMERICAN ASSOCIATION OF ENGINEERS. Fourth annual convention, Chicago, Ill. Secretary, A. H. Krom, 29 South LaSalle St., Chicago.

May 15, 16.—SOUTH DAKOTA ELECTRIC POWER ASSOCIATION. Annual convention, Carpenter Hotel, Sioux Falls.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Gosa, 315 Plymouth Court, Chicago, Ill.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springa, Ark.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, Roanoke, Va.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Water Works Association.

The following is the program for the sessions of the 38th annual convention of the American Water Works Association to be held May 13-17 in St. Louis, Mo., with headquarters at the Planters Hotel.

The executive committee will meet at 10 a. m. Monday morning. At 8.30 in the evening, mayor H. W. Kiel, of St. Louis, will deliver the address of welcome. There will then be an informal reception and dance at the Planters Hotel.

Tuesday, May 14, 9 a. m.—President's address, "Emergency Construction Work Due to War Conditions." Illustrated lecture, George W. Fuller. Report of canvassing committee on election of officers for 1918-1919; report of executive committee; report of special advisory committee on amendments to the constitution, and action on the amendments proposed; reports of officers and standing committees. Announcement of cup winner for section having made the greatest percentage ncrease of membership in the year 917-1918.

1.45 p. m.—Golf tournament under the auspices of the permanent golf commitee of the Water Works Manufacturers Association and the American Water Works Association, entirely complimentary through the courtesy of the local entertainment committee; or visit to works of the Anheuser Busch Brewing Association for those who do not care to attend the golf tournament. Through the courtesy of the local entertainment committee.

8 p. m.—"Management of Public Utilities in Cantonments," Major P. Junkersfeld; "The Artesian Water Supply of Savannah, Georgia," E. R. Conant; "Design of a Tilting Dam and Its Relation to Back Water on the Gunpowder River," V. B. Siems; "Water Treatment Conditions at Council Grove, Kansas," Louis L. Tribus.

Wednesday, 9 a. m.—Four papers on special features of St. Louis water works: "Some Phases of Distribution Work," W. A. Foley; "The Double Forty-eight Inch Manifold at Bissell's Point," C. M. Daily; "The New 110-Million Gallon Pump at Chain of Rocks," L. A. Day; "Some Aspects of Chemical Treatment at St. Louis Water Works," A. V. Graf.

11 a. m.—Special order of business. Election of nominating committee and selection of place for holding the 1919 convention. Members of the various sections should have their selections made and be ready with nominations promptly.

12.30 p. m.—Boat trip on Mississippi river, starting at 12.30 p. m. sharp. Luncheon to be served on the boat. Trip to be made to the mouth of the Missouri river, stopping at St. Louis water works on return, arriving in city at 5.00 p. m. Trip by courtesy of local entertainment committee.

8 p. m.—"Literature of Field Water Supply," Jack J. Hinman, Jr.; "The Practicability of Adopting Standards of Quality for Water Supplies," Robert B. Morse and Abel Wolman; "Preliminary Analysis of the Degree and Nature of Bacterial Removal in Filter Plants," Abel Wolman.

Thursday, 8 a. m.—Superintendents' Day. Experience papers and general discussion on Frozen Service Pipes, Water Mains and Fire Hydrants, and New Maxims in Water Consumption based upon experience of the winter of 1917-1918. A number of short experience papers on these subjects will be presented.

2 p. m.—Discussion of Office Records, covering Distribution Mains, Gate Valves, Service Pipes, Pipe Laying, etc. Short papers, illustrated by lantern slides, will be read at this session.

8 p. m.—"Loss of Head in Service Cocks and Service Pipes," B. J. Bleisteine; "Lead Pipe Couplings," J. A. Jensen. Discussion of Resolution on Effect of War Time Conditions on Water Works Management.

9 a. m.—Informal dance at the Planters Hotel at 9.30 p. m. Courtesy of the Water Works Manufacturers Association.

Friday, 9 a. m.—Reports of special

(*Continued on page 384*)

PROBLEMS CITIES ARE STUDYING

WITH EXPERTS

STREET IMPROVEMENTS are to be made by Berwyn, Ill. E. Hancock is the consulting engineer for the work.

Erving, Mass., is to construct a WATER SYSTEM. The engineers for the improvement are the firm of Allen & Haywood.

A SANITARY SEWER SYSTEM is to be built by Pinebluff, Wyo., from plans and specifications prepared by R. D. Salisbury.

PAVING IMPROVEMENTS are to be made by Howell, Mich., the consulting engineer, George Champe, having completed plans for the work.

Pawnee County, Larned, Kan., is to construct about 27 miles of roads. The consulting engineering firm of Black & Veatch has been retained to make surveys.

Dearborn, Mich., is to construct a SEWERAGE SYSTEM, including sewers, disposal plant and pumping station. Plans and specifications for the system were prepared by the consulting engineer, Clarence W. Hubbell.

Weston, Mo., is to make PAVING IMPROVEMENTS according to plans prepared by the engineers, C. E. McCrae.

Cleveland, Okla., proposes to make PAVING IMPROVEMENTS, plans being in course of preparation by the Benham Engineering Co.

West View, O., is constructing a sanitary SEWER according to plans and specifications prepared by the engineering firm of Blum, Weldin & Co.

Adams county, Gettysburg, Pa., is to build a BRIDGE. Plans for the structure are to be prepared by Charles A. Williams.

Aurora, Ill., is having a PARK SYSTEM, including roads, lighting, water supply and other improvements, laid out. Revised plans are being prepared by the American Park Builders.

The Wood River Drainage & Levee district, Wood River, Ill., is to make DRAINAGE IMPROVEMENTS. Plans and specifications for the project were prepared by the engineering firm of Sheppard & Morgan.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant. Quotations. Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A, $1 extra.

The Permutit Company, 440 Fourth avenue, New York, N. Y., announces that Albert Tate Smith, lately manager of the R. U. V. Company, New York City, has returned to The Permutit Company, with which he was formerly connected, to take the position of assistant manager of sales. Mr. Smith is widely known in the water purification field.

The Asbestos Protected Metal Company, Pittsburgh, Pa., has changed its name to **Aspromet Company,** effective May 1, 1918. When this company was established in 1905, its sole product was Asbestos Protected Metal. The initial product meeting with universal favor the company added to the line other building materials that were used and bought by the same people who use and buy Asbestos Protected Metal. The company now produces a very complete line of building material specialties, many of which contain neither asbestos nor metal in their make-up. The descriptive name, Asbestos Protected Metal Company, which originally served so well, thus became restrictive to the point of being misleading; hence the change.

Construction Machinery in India.—According to consular reports, southern India, upon a resumption of normal conditions after the war, will offer a good field for construction machinery. Even under existing conditions trade has been very active, and much construction has been going on, but lately there has been a falling off, apparently, in both respects on account of general conditions—scarcity of tonnage, difficulty in obtaining materials, and general tendency toward retrenchment.

The greatest engineering undertakings in southern India, excluding, perhaps, the railways, are the irrigation projects. In addition to the immense works already under construction in the country or sanctioned by the Government, there are under consideration or investigation other works estimated to cost nearly $140,000,000. Most of the tools, machinery, and materials used for the great Government irrigation works are obtained in England through indents furnished the India office in London by the public-works department of the Government of India and those of the Provinces, and a large quantity of supplies and material also is purchased in India itself as convenience or necessity may require. In the Madras Presidency irrigation work is under the chief engineer for irrigation, department of public works, Madras. For the Native States of Mysore and Cochin, the Dewan, or Prime Minister, supervises all public work. For Hyderabad there is a special engineer in charge of irrigation. Some particularly large irrigation schemes are projected in Hyderabad. General public works construction in Madras, including even railways, is under the chief engineer and joint secretary to Government, public works department.

The considerable amount of harbor work that has been in progress in Madras, and a great deal more that is projected before completion of the harbor according to plans, is under the direction of the Madras Port Trust, a semigovernmental organization. The trust has lately asked the Government for an additional appropriation of about $1,000,000. A great amount of cement is used in the harbor work, besides which the trust operates and owns lighters, tugs, dredges, derricks, and cranes, dockyard machinery, light locomotives, and, in fact, all sorts of material used in such projects. Although nearly all of it is purchased in England it would be advantageous to write to the chairman of the trust. Harbor work is projected also at Cochin.

NEWS OF THE SOCIETIES

(*Continued from page 383*)

committees: Depreciation, John W. Alvord, chairman; Revision of Standard Specifications for Cast Iron Pipe and Specials, John H. Gregory, chairman; Private Fire Protection Services, Nicholas S. Hill, Jr., chairman; Official Standards of Water Analysis, William J. Orchard, chairman; Mechanical Analysis of Sand, Phillip Burgess, chairman; Standard Specifications for Wrought Iron Pipe, A. A. Reimer, chairman; Classification of Technical Literature, Nicholas S. Hill, Jr., chairman; City Planning, Ernest P. Goodrich, chairman.

Unfinished business.

New or miscellaneous business.

Topical and general talks for the good of the association.

National Fire Protection Association.

The influence of the war will be felt at the twenty-second annual meeting of the National Fire Protection Association, which is to be held in Chicago on May 7, 8 and 9. The assumption of new or additional responsibilities by the chairmen of one or two committees may involve the postponement for a year of the consideration of particular technical problems; the presentation which is to be given of the activities of the member, the National Board of Fire Underwriters, during the present crisis will vividly bring home to members the importance of maintaining in full vigor at this time every agency of fire protection and prevention.

Notwithstanding the difficulties, a number of committee reports involving matters of moment will come before the meeting. The committee on "Field Practice" has been considering the whole question of "first aid" hand fire protection, in addition to continuing its investigations of the problem of gate valve control; contributions of great importance will be made by the committees on "Fire-Resistive Construction" and on the "Uses of Wood in Building Construction;" thorny questions will again be brought up for discussion by the committee on "Nomenclature;" the committee on "Safety to Life" will ask for final acceptance by the Association of a standard method of establishing the number of persons that may with reasonable safety be permitted in buildings of different types under a variety of conditions; and the committee on "Tanks" has prepared detailed specifications of performance in connection with the installation of scuppers. Several other committees are also expected to report.

The "round table" this year will be on the subject of "Fire Protection in Hotels and Apartment Houses," and it is also planned to have a special discussion on "Zero Weather Hazards."

A new feature will be the luncheon on Wednesday, May 8, at the Hotel La Salle, to be addressed by Dr. Gunsaulus, president of the Armour Institute of Technology. This is to be followed by an official visit to Underwriters' Laboratories.

PERSONALS

Anderson, A. T., chief of the Marshalltown, Ia., fire department, has resigned. Chief Anderson served in both the paid and volunteer departments for a period of twenty-six years, sixteen of which have been in the paid department. In his resignation he made application for a pension under the state law, which was refused by the council because it did not believe that the law governed in his case. He has been succeeded by James H. Ellis, a new member of the force.

Baker, C. M., has resigned his position as assistant engineer with the New York State Department of Health and has accepted an appointment as sanitary engineer in the United States Public Health Service. He is at present in Macon, Ga., engaged in work in connection with the control of malaria in the extra cantonment zones.

Edwards, L. V., professor of highway engineering, Washington State College, Pullman, Wash., is now assistant county engineer of Whitman County, with headquarters at Colfax. He will be an assistant to county engineer J. M. McCaw, and will act in the capacity of a consulting engineer.

Ellms, J. W., superintendent of filtration, in charge of the water purification works of Cincinnati, has resigned to become engineer of water purification, Cleveland, O., waterworks. He will have full charge of the West Side filtration plant, and will assist in the designing of the proposed East Side water purification plant.

Municipal Journal

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MUNICIPAL DAM AT FORT DODGE

Used in Connection with Power House to Create Electric Power for the Water Works Pumping Plant and for Commercial Use—Also Forms Lake Used as a Pleasure Resort.

The city of Fort Dodge, Iowa, with about thirty thousand population and located on the Des Moines river, conceived the idea of building a municipal dam, with two objects in view: First, a financial investment that would be profitable to its citizens from the sale of power that would be developed; and, second, the creation of a lake that could be utilized for pleasure purposes. Fort Dodge being an inland city and a long distance from any large body of water, the lake idea for fishing, boating and bathing proved to be very popular. The citizens were determined, however, that the project should be municipally owned and controlled. It was advocated by private parties with a franchise in view, but this was defeated at the polls, and after two unsuccessful efforts the city finally voted bonds for the municipal project.

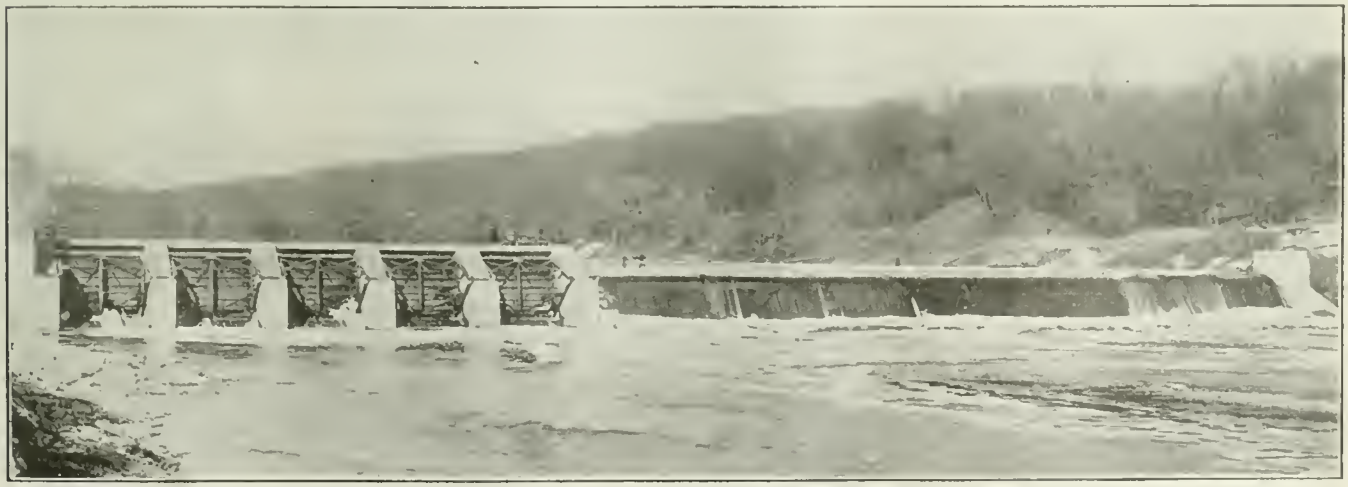
The feasibility of the project was patiently explained and exploited by mayor John F. Ford for a number of years before the public became fully aroused as to its desirability. The campaign for the bonds under the auspices of the Commercial Club was an interesting feature of the entire enterprise. The engineers transferred their preliminary plans, estimates and all data to stereopticon slides and these slides were shown at mass meetings previous to the bond election. The slides showed the proposed sites and also pictures of how the dam would look after construction, and with these illustrated lectures given by the engineers, the citizens were enabled to vote intelligently on the project.

The bond issue for the improvement carried by a large majority, and on the seventeenth of June, 1916, a contract for the construction of the dam was let to the Koss Construction Company of Des Moines, Iowa, and another for the power equipment and machinery installation to the Merkle Machinery Company of Kansas City, Missouri. The difficulty of carrying on the construction work because of the scarcity of materials and labor, together with the handicap of high water and ice, made the whole project one of unusual difficulty.

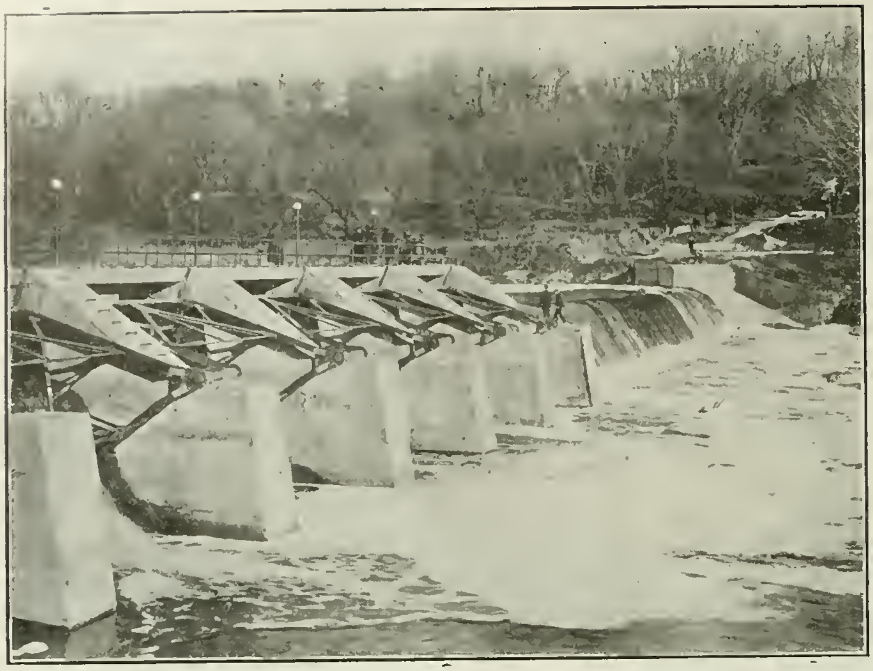
The spill-way section of the dam is 230 feet long and is of solid concrete construction. The dam has a height of 18 feet above the bed rock of the stream, with a concrete toe 4 feet deep and 3 feet wide on the upstream side. The concrete portion of the entire structure is 412 feet wide, including a concrete fish-ladder at one end as required by the state law of Iowa.

One hundred and thirty feet of the dam consists of five sluice gates of the Tainter type, built of structural steel, with a radius of 17 feet, and arranged so that all five gates may be raised by a motor-propelled electric hoist, allowing the flood stages of the river to pass through the gates, thus avoiding overflowing large areas of land that otherwise would be inundated at flood stages of the river. The raising and lowering of the gates controls the water level above the dam during high water seasons, and also in the winter, and can be manipulated in order to avoid the structure being damaged by ice in the spring.

The concrete spill-way of the dam was finished the 28th of February, 1917; and on March 21st, three weeks afterwards, while the gates were open, a heavy mass of ice came down the river with so much velocity that it tore out the walls of the head-gate chamber and damaged the structure considerably. Before the gates could be closed, large blocks of ice several feet thick passed over



GENERAL VIEW OF FORT DODGE MUNICIPAL DAM.



NEAR VIEW OF GATES AT POWER HOUSE END OF DAM.

the dam and the water on the down-stream side of the dam being low, the ice went over the dam without any cushion of water to break the force of the blocks of ice dropping over the dam. This grinding and hammering effect of the large blocks of ice on the toe of the dam caused a large hole to be scoured out on the down-stream side of the dam. The limestone was fissured and through these fissures in the bed rock streams developed which scoured out a large opening under the dam. Considerable damage was done before the gates could be closed and the water raised so that the water then passed over the crest of the dam and the ice could have a cushion to fall upon as it passed over the structure.

The repairing of the hole under the dam was accomplished by driving steel sheeting on the up-stream side of the dam and building a coffer-dam on the down-stream side of the dam. The hole, which was about sixty feet in length and large enough for a man to walk through, was poured full of concrete and a reinforced concrete apron was constructed on the down-stream side of the dam. The solid concrete dam for several months formed a perfect arch over the hole under the dam before repairs could be completed. The high-water stage of the river came and passed before the repairs could be completed, thus adding another danger in carrying out the construction work. The entire repairs were finally finished on December 14, 1917, and the plant was tested out and accepted by the city on March 1, 1918. The total cost of the project, including power house, turbine, generator and transmission line, was approximately $130,000. Careful examination showed the original structure to be of excellent construction, and the fact that the dam for a stretch of sixty feet from side to side over the opening, containing three and one-half million pounds of concrete, withstood the strain seems to be ample evidence that there was nothing faulty about the concrete work.

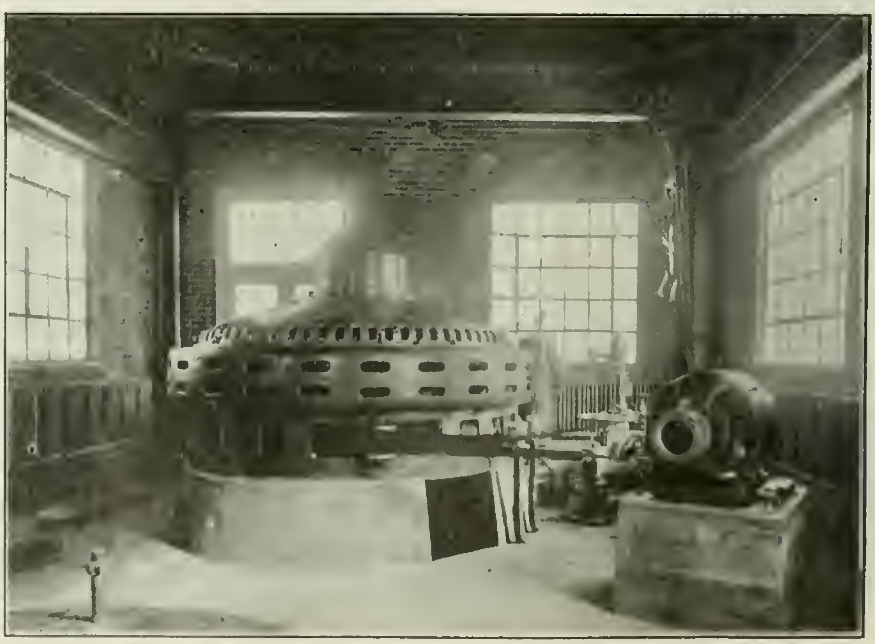
The power house is of brick and reinforced concrete construction, fifty-six feet long and twenty-two and one-half feet inside width. One five-hundred-horsepower vertical turbine of the Francis type was installed and foundations are already built for a second unit, which will be installed later, and thus give a total development of one thousand horsepower. The power is transmitted to the water works station about three-quarters of a mile below the dam and used for pumping the water. Since placing the plant in operation the city has accomplished a saving of approximately $40 per day on fuel alone. Arrangements are being made for selling the surplus power, as there is a good demand for the power at a number of mills and factories close by.

The lake formed by the backing up of the water is about eight miles in length and will average five hundred to six hundred feet in width. The wooded hills on each side of the stream and high bluffs at various points add to the attractiveness of the lake, and it is believed that the spot will prove especially attractive, not only to the citizens of Fort Dodge, but also to surrounding communities who heretofore have been compelled to travel hundreds of miles to visit any recreation spot.

The design and supervision of the work was carried out by Burns & McDonnell as consulting engineers, with Leland C. Angevine as resident engineer in charge of construction, who has since been retained by the city and placed in charge of the operation of the municipal power plant.

PAVING OVERFLOWED ROADS.

Shelby County, Ind., last year laid about 14 miles of gravel roads, and included in the contract about 600 square yards of concrete pavement, 1—2—3 mix. The object of providing this comparatively small amount of concrete was in order that it could be used in certain low places in the roads which are liable to overflow,



500 HORSEPOWER VERTICAL TURBINE AT FORT DODGE.

which overflow would probably destroy the gravel roads. The entire roadway was graded for a width of 20 feet, while the gravel surfacing was made 14 feet wide and the concrete 12 feet wide. The 14 miles of gravel road, including grading, concrete paving and culvert work, cost about $42,000.

HAMTRAMCK'S INCINERATOR

Twelve-Ton Plant for Michigan Village—Located in Closely Built-up Section—Details of Operation During First Five Months.

By EARLE L. WATERMAN.*

One of the municipal problems at Hamtramck, Michigan, which became most acute owing to the rapid growth of the village was that of garbage and refuse collection and disposal. This work had been done by contract previous to the summer of 1917 but the results were not satisfactory, so the work was taken over as a part of the municipal program. Special garbage collection wagons were purchased and a 12-ton capacity garbage incinerator was built. The incinerator was completed and put into operation in August, 1917.

Hamtramck, Michigan, is a suburb of Detroit, lying northeast of that city. It forms a part of Hamtramck township, Wayne county, and was incorporated as a village in 1901. The location of several large automobile factories within or near its borders has resulted in a remarkable growth during the last few years. A special government census of the village taken in 1915 shows a population of 21,250 as compared with 3,559 in 1910.

The new garbage and refuse incinerator is located on Tyler Ave., just north of the Michigan Central R. R., in a closely built-up section of the village, only a few minutes' walk from the City Hall. It is a double unit of 12 tons capacity, housed in an attractive building of the bungalow type, 32 feet by 70 feet in plan. The interior walls of the building are of white sand-lime brick and the exterior walls are faced from the water table to the top of the wall with shale mat brick laid in black mortar. The general appearance of the plant is neat and attractive.

There are three distinct divisions in the plan of the building—the charging floor, located in the front end; the furnaces, in the center; and the operating floor and coal bunkers at the rear. The charging floor, arranged on the drive in and drive out plan, is at the same elevation as the top of the furnaces, so that the garbage may be dumped through openings in the floor directly into the incinerating chamber. On arriving at the plant, the load of garbage is first weighed, the liquid is then drawn off and the load moved on to the charging floor into such a position that, when the front end of the wagon is elevated, the garbage will be discharged through the chute-shaped rear end of the wagon into the incinerator. The wagon and floor are then thoroughly cleaned with hot water. The floor is arranged so that it drains readily through floor drains which are connected to the sewer system. The time elapsing between the arrival of a loaded garbage wagon at the plant and the departure of the same wagon is less than five minutes.

EXTERIOR VIEW OF HAMTRAMCK INCINERATOR.

There are two furnaces located in the center of the building, each having a capacity of six tons of mixed garbage and refuse per 24 hours. Each furnace is a complete unit, having a grate 22 inches by 48 inches, located at the right of the combustion chamber and at the same elevation as the floor of the chamber. The combustion chamber is 8 feet 10 inches wide and 12 feet 8 inches long. The arch over this chamber is 38 inches above the floor at the center and 18 inches at the sides. Heat generated at the grate passes out over the garbage, a wedge wall deflecting it in such a way as to cause it to act for a maximum length of time before entering the base of the stack. The stack is 40 feet high and contains two 12-inch flues, one connected to each furnace.

A Hoskin's indicating pyrometer is installed and enables the operator to determine the temperature over the fire box and at the base of the stack in either furnace. Past experience has shown that in the combustion chamber a temperature of at least 1150 degrees of Fahrenheit is necessary to insure complete destruction of the odorous gases which may arise from the burning garbage. It is also desirable that the temperature in the fire box be above a certain point when a fresh charge of garbage is put into the furnace. The indicating pyrometer enables the operator to determine the temperatures which give the best results and should prove of great value in securing efficient and economical operation.

An important feature of this plant is the arrangement made for furnishing a continuous supply of hot water for cleaning purposes. Water from a city service line passes through coils located inside the wedge wall of the furnace and then into a hot-water tank having a capacity of 144 gallons. The heating coil is not in direct contact with the fire and can be removed without interfering with the furnace operation. Steam line rubber hose, connecting with the hot water line, makes it possible to use the hot water at any point on the charging floor.

At the rear of the building and just beyond the firing floor are coal bunkers having a capacity of 100 tons. Wash rooms, lavatory, toilet and locker space are located above the coal bunkers and are reached by a stairway leading up from the firing floor and are connected by a gallery to the charging floor.

The contractor's guarantee was that this plant would consume 12 tons of mixed garbage and refuse per 24 hours with the use of not over 300 pounds of bituminous coal per ton of material destroyed when the plant is being operated at its full capacity and that the plant would operate without creating disagreeable odors. A partial test of the plant, made on August 6th, 1917, satisfied the village authorities that the guarantee had been met and the plant was accepted.

RESULTS OF OPERATION.

Records of the amount of garbage delivered to the plant and the amount of coal used have been kept since October 1, 1917. These data are given in the table on the next page.

It will be noted that during the period for which data are given the amount of garbage collected per month has been decreasing. This may be due to several causes —first, that the amount of garbage is naturally less during the colder months; second, that more garbage is taken care of by the individual householder during the winter months; and, third, that there has been a marked reduction in the amount of kitchen wastes as a result of the educational campaign of the U. S. Food Administration.

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*Formerly Assistant State Sanitary Engineer, Michigan State Board of Health.

Results of Operation of Hamtramck Incinerating Plant.

Year and Month 1917	Tons of Garbage Collected	Tons of Coal Used	Pounds of Coal Per Ton of Garbage
October	60.5	9.5	312
November	68.5	13.5	394
December	39.5	7.5	380
1918			
January	38.5	7.5	390
February	34.0	7.0	412

The amount of coal used per ton of garbage during the last five months has averaged 377 pounds, or 26 per cent higher than the contractor's guarantee. This condition must be attributed to the fact that there has not been enough garbage to operate efficiently the one unit in service. It is also to be expected that the frozen garbage collected during the winter months will require more coal for its destruction than that collected during the warmer weather.

The plant operation is under the supervision of the health officer, Dr. X. A. Jones, to whom the writer is indebted for the operation data given above. Dr. Jones reports on operating conditions as follows:

"The plant is kept in a strictly sanitary condition so far as odors and other objectionable features connected with the average incinerating plant are concerned, and we cannot speak too highly of this system of incinerating. We expect to see a marked reduction in coal consumption during the summer months, which will bring our yearly average within the estimate set by the builders."

The Hamtramck incinerating plant was built by Horace Dollarhide of Springfield, Illinois, Michigan agent for the McGuire-Hunter Sanitary Incinerator Co., of Springfield. The contract price for the complete plant was $14,878.

WATER WORKS OPERATION-DISTRIBUTION SYSTEM.

Importance of Records of Location, Depth, Etc., of Mains and Appurtenances—Map of Distribution System, Detail Records.

A number of years ago there lived in a large New England city a superintendent of water works whose brains contained the sole record of the locations of the mains and valves and other underground features of that city's distribution system. In the natural course of events he died, and that city, after years of investigation, still wonders whether it has yet learned the location of all of its valves and mains.

We do not believe that this particular superintendent refrained from keeping records of these matters with the idea of making himself so invaluable that the city's officials would not dare to discharge him; but where such condition is permitted to exist, an advantage of this kind may well be taken by an unscrupulous superintendent. For example, Municipal Journal described, a few years ago, a condition of affairs in a western city in which a water works superintendent and his assistants, who were removed from office by an incoming administration, claimed that all of the records of the office were their private property inasmuch as the keeping of such records was not one of their prescribed duties, and took all such records with them and refused to surrender them. In this emergency the new administration apparently admitted its doubt as to the legal rights of the city in the matter by failing to prosecute the ex-superintendent, but instead placed an extra force at work for a few weeks determining the location of the various features of the distribution system.

Even mental or personal-property records of locations are better than no knowledge at all. The writer, when laying out a sewer in a certain New York State city some years ago, was informed by the water works superintendent that he knew the water main was on the east side of the street, for he always laid the main as near the curb as possible and on the side of the street on which the first house therein was built. When the sewer trench was excavated in this block, the water main was found running diagonally from the eastern side at one end of it to the western side at the other end, the reason for this location apparently being that the second house on the block was located on the western side and the main was located as nearly as possible on a straight line from one house to the other, presumably to permit using the minimum length of service pipe.

These three illustrations, cited as they occurred to the writer, illustrate some of the reasons why written, official records of all underground features of a distribution system are most important for the proper and economical operation and maintenance of the system and can hardly fail to be worth many times their cost. In fact, the cost is merely nominal if the records are kept up to date, since this means merely recording in a pocket notebook, at the time of construction, the location and other details of each pipe or appurtenance set, and copying these into the official record book on rainy days or at other times when opportunity permits.

A superintendent who wishes to save himself future annoyance, to make possible the systematizing of his work, and to perform his duties in the manner most serviceable to the city, should make it his first business upon taking charge of a water works system, whether new or old, to make sure that there are on record in the office all the essential items of information concerning all features of the distribution system; and if such are not to be found recorded in sufficient completeness, the making or perfecting of such records should be one of his first duties. The situation is analogous to that of a superintendent of a factory or large business, who cannot properly perform his duties until he has on hand an inventory of all the machinery, materials, goods and other property over which he has control. If the city ordinances, the company's rules and regulations, or the contract under which the superintendent serves, do not distinctly specify that the keeping of such records is a part of his duty, such provision should immediately be made; and in the meantime professional ethics should dictate that the keeping of such records is the moral duty of every superintendent, even though it may not be the legal one.

MAPS OF DISTRIBUTION SYSTEM.

The permanent records should include a large map (generally a wall map) on which are indicated by lines the extent of the distribution mains, the size of each main being indicated either by colors, by combinations of dots and dashes, or by figures. The first has the objection that if many different sizes are used and the number of colors used becomes great, there may be difficulty in distinguishing between them, especially if they have faded out. Almost any number of sizes in commercial practice may be indicated by combinations of dots and dashes, the use of 1, 2 or 3 dots with 1, 2 or 3 dashes permitting eleven combinations. Such a system requires, of course, careful explanation in a "legend" on the map, which must be added to from time to time as new sizes are laid. The use of figures on each pipe line permits reading directly without reference to the "legend" and eliminates the necessity of counting the number of dots and dashes and the possibility of error on the part of the draftsman in drawing the line. There seems to be little objection to this practice, except that the map does not present quite so good an appearance.

In addition to the mains that are laid, this map generally shows also the location of each fire hydrant and each valve. In some cases proposed extensions of the system also are indicated, either in pencil or in inked lines and figures made much lighter than those indicating constructed mains.

For simplicity in keeping records of hydrants and valves and insuring that every one is accounted for and none is counted twice, it is desirable to give each hydrant and each valve a number. One reason for this is that both hydrants and valves are commonly placed at street intersections, and consequently might readily be recorded twice, once in summing up the appurtenances on each of the intersecting streets. Given a city one mile square laid out on the rectangular system with blocks measuring 350 feet on each side from centre to centre of street, and if mains are laid in all streets, such a city would contain thirty miles of mains, and if there be one fire hydrant for each 500 feet of main, as is a common average, we would have in this city 317 fire hydrants. In cities adequately provided with valves, the number of these will ordinarily be from two to four times that of the number of hydrants. It is apparent, therefore, that even in a comparatively small city the number of these fixtures is so great that some may be overlooked in the records unless some systematic method of recording them is adopted.

It will aid considerably in locating valves and hydrants by their numbers if a system be adopted for alloting these. For instance, coordinates may be drawn through the centre of the city and all hydrants or valves in the northeast quadrant may have numbers ranging from 0 to 199, those in the southeast from 200 to 399, those in the southwest from 400 to 599, and those in the northwest from 600 to 799. In addition, the first hundred in each quadrant may lie in a strip running east and west and extend for a certain distance above or below the east and west coordinates. The second hundred would lie within a second strip of approximately the same width and parallel and adjacent to the first. For a city which is or promises to be large, it may be desirable to allot more than 200 to a quadrant; or when the number in any quadrant or in any hundreds strip reaches its limit, all limits may be increased ten fold, giving 2,000 to each quadrant in the above illustration.

DETAIL RECORDS.

This large map, on which are indicated the general locations of mains with their sizes, of fire hydrants and of valves, is the most essential record of the distribution system, but it should not be the only one. Not only should the superintendent know what size of main is laid in a given street, but he should also know exactly its depth below grade, its location with reference to the centre or side line of the street, and the exact location of every plugged T or other special left in the line for making future extensions. It is also desirable that he know the date at which the pipe was laid, the foundry from which it was obtained and the name of the contractor or other party who laid it. Also, for the benefit of his successor (and all superintendents must die some time, even though they retain their positions during their lifetime) and even for his own later information, it is desirable to keep a record of the history of each main—leaks or breaks which may develop, repairs made, etc. There should also be recorded the exact location of each service tap made in the main, and the kind of service pipe, goose neck, make of curb-cock, etc., to be entered immediately after the construction of the service. All of these locations and dimensions can be indicated more concisely and definitely by a diagram than by any amount of descriptive matter; and the records should therefore preferably consist of a diagram giving the required dimensions, together with such written description as is necessary to describe the kind and make, the material used, date constructed, name of property owner, name of plumber doing work, etc.

It is too often assumed that the location of valves is sufficiently indicated by the valve box in the street surface. In the first place, the difference between being able to find a valve by going on the ground and looking for it (which may involve shoveling snow off the entire street intersection), and knowing beforehand just where to find the valve and going directly to it, may represent thousands of dollars of loss to property in case of a broken main if the valve can be located and closed in one minute instead of in five to thirty minutes. Moreover, without a diagram showing the location of all valves, it may not be possible to know just which one it is necessary to close in an emergency or where it is best to locate new valves in making extensions; or in general to study a given system and assure oneself of the adequacy of control furnished by the valves.

In the great majority of cases, valves are located at street intersections and it is generally sufficient to place on the records diagrams of such intersections; valves located elsewhere being indicated by special drawings. Since fire hydrants also are commonly located at street intersections, it would economize in records to use the same ones for indicating the positions of both valves and hydrants. As in the case of mains, diagrams can be used most conveniently to show locations and dimensions, while accompanying descriptive matter gives the other information. Concerning valves, the records should give for each the number alloted to it; the size by which it is designated; name of maker; year set; depth below street surface; location with reference to curb corner, property line, or other well-defined object or line in the street; the direction in which it must be turned to open (generally designated as right-hand when turned clockwise and left-hand when turned counterclockwise), and the number of turns required to open or close it.

Of fire hydrants, the records should give the allotted number; size by which it is commercially designated; the depth of the connection below the surface; whether there is a valve in this connection and if so its location with reference to the hydrant; how drainage of the hydrant is effected (whether by drain-pipe to the sewer, by broken stone placed around the hydrant, etc.); direction of turning to open and number of turns, name of maker, and year set.

In the case of both valves and hydrants, all should open by turning in the same direction. Absence of such uniformity has resulted in twisting off the stem, failure to close or open a valve in an emergency, and many other unfortunate and costly mishaps; in spite of which, a number of cities have in service valves opening in both derections.

All of the above information concerning mains, valves and hydrants should be obtained when these are laid, for at that time the obtaining of this information is a matter of no difficulty and little trouble. If, however, such information was not recorded at that time and must be obtained later, much can be done at no great expense. In the case of fire hydrants, these of course can be found without difficulty and the size of barrel determined. The depth of service pipe can be learned by taking off the bonnet of the hydrant or by dropping a

CLEANING MAINS, LEAKAGE AND METERS.

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
Alabama:						
Gadsden	No	....	Check meter readings with pump readings	No	100	City
Talladega	No	....	Inspecting fixtures	No	90	City
Arizona:						
Nogales	....	....	....	....	95	City
Arkansas:						
Eldorado	Yes	Flushing	None	Think not	60	Company
California:						
Anaheim	Dead ends	Flushing	....	....	100	City
Glendale	No	....	None	No	100	City
Los Angeles	No	....	Leaks come to surface	No	95	City
Oxnard	No	....	Leakage comes to surface	....	7 meters	City
Pacific Grove	No	....	....	No	100	Company
Redlands	....	Flushing	Sonoscope	No	60	City
Riverside	No	....	Aquaphone	No	12	City
Santa Maria	Yes	Replacing	Compare pumping and consumption	No	75	City
Stockton	Yes	Flushing	Pitometer	No	17	Company
Colorado:						
Ft. Morgan	No	....	Inspection	No	1.9	City
Colorado Springs	No	Not cleaned	Inspection	No	2	Consumer
Longmont	Yes	Not cleaned	Leaks come to surface	No	6	Both
Connecticut:						
Ansonia	Probably	Never cleaned	Meters	No	....	Company
Bristol	No	Not cleaned	....	Think not	86	City
E. Hartford	No	....	Leaks come to surface	No	3	City
Middletown	Yes	Flushing	Inspection and aquaphone	No	99	City
New London	....	....	Meters	Yes	54	City
S. Manchester	Do now	Not done	Most come to surface	....	100	Company
Southington	Wrot iron do	Renew with larger	Meters and inspection	No	10	City
Suffield	No	....	None	No	100	Company
Wallingford	No	....	Inspection	No	18	City
Willimantic	No	....	Leak locator	No	90	City
Windsor Fire Dist.	Yes	Flushing	House inspection	No	8.4	City
Florida:						
Daytona	Yes	Flushing	House inspection	No	100	City
DeLand	No	....	Sonoscope	No	95	City
Ft. Myers	No	....	....	No	95	City
Orlando	Yes	Water power turbine cleaner	Inspection	No	10	Company
St. Augustine	Yes	By contract	Darley leak finder	No	50	City
Georgia:						
Americus	No	....	Observation	No	100	Consumer
Atlanta	No	....	Rigid inspection	No	100	City
Lagrange	No	....	....	No	100	City
Milledgeville	No	....	Inspection	No	66	Company
Thomasville	No	....	None	....	100	City[d]
Tifton	Yes	Flushing	Leak locator	No	100	Consumer
Waynesboro	No	....	No	No	90	City
Idaho:						
Boise	No	....	Surface indications	No	95	Company
Lewiston	No	Flushing	House inspection and surface indications	No	70	City
Twin Falls	No	....	....	No	0.1	City
Weiser	No	....	House inspection and surface indications	No	100	City
Illinois:						
Bloomington	Yes	Flushing	Measure pumpage	No	100	Consumer
Champaign	No	....	Inspection	No	90	Consumer
Downers Grove	No	Flushing	House inspection	No	100	Consumer
Flora	No	....	....	No	90	City
Freeport	No	....	....	No	90	Company
Lake Forest	No	....	Monthly inspection	No	100	Both
Marshall	No	....	None	Yes	2	Consumer
Mt. Vernon	Yes	By contract	Aquaphone	No	90	Company
Mendota	Yes	Flushing	Meters	....	100	Consumer
Paris	No	....	Leak detector	No	20	City
Peru	No	....	Recording gauge	No	100	Consumer
Quincy	No	Not cleaned	Surface inspection	No	70	City
Rock Island	....	Flushing	Inspection Meters	No	33	City
Watseka	Yes	Flushing	None	Yes	100	City
Indiana:						
Bedford	Yes	Flushing	....	No	2	City
Brookville	Yes	Flushing	None	No	0.03	Both
Delphi	No	....	Inspection and meters	No	65	City
Elwood	Yes	Flushing	....	No	70	Company
Ft. Wayne	Yes	Flushing	None	No	100	Consumer
Goshen	No	Flushing	None	No	70	City
Knightstown	....	Not done	Meters	No	100	City
La Porte	Yes	Flushing	Inspection	No	9	City
Lebanon	....	Flushing	None	No	76	City
Linton	....	Flushing	Surface indications	No	15	Company
Mishawaka	No	....	....	No	100	City
No. Manchester	Dead ends	Flushing	None	No	95	City
Peru	Yes	Flushing	Inspection	No	5	City
Plymouth	No	....	Surface indications	No	100	City
Terre Haute	No	Flushing	....	No	94	Company
Tipton	Yes	Flushing	Meters	No	95	City
Vincennes	No	None	None	Think not	30	Company

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d—Meters owned by consumer until 1912, by city since 1912.

METERS. RATES. MUNICIPAL USE.

City and state	Is deposit on meter roquired?	Is rental charged for meters? †	Does city obtain water without payment?	Uso made of free water	Used for Municipal Purposes	
					Percentage	Is any of it metered?
Alabama:						
Gadsden	Yes	No	Yes	Schools, buildings, flushing streets and sewers	20	All city buildings
Talladega	Not usually	....	Yes	Street sprinkling, schools, public buildings, fountains, flushing sewors	60	No
Arizona:						
Nogales	Somo cases	No	No	....	......	No
Arkansas:						
Eldorado	New property owners	No	No	....	......	No
California:						
Anaheim	$10[a]	No	Yes	....	2	No
Glendale	By tenants	....	No	....	None	....
Los Angeles	....	No	Yes	All municipal uses	20	No longer
Oxnard	No	No	Yes	Sprinkling, street flushing, parks, city buildings, etc.	......	No
Pacific Grovo	No	No	No	....	......	....
Redlands	No	No	....	Fire	3	Yes
Riverside	No	No	No	....	......	Yes
Santa Maria	No	Minimum rate	No	....	......	....
Stockton	Yes	Minimum charge	No	....	7	All
Colorado:						
Ft. Morgan	No	No	Yes	Park, public, buildings, fire	......	No
Colorado Springs	....	....	Yes	All purposes	40	....
Longmont	No	No	Yes	Parks, city buildings, etc.	5[b]	No
Connecticut:						
Ansonia	No	Minimum charge	Yes	Watering troughs	......	....
Bristol	....	For secondary meters	No	....	......	All except street and sewer flushing
E. Hartford	No	No	No	....	......	....
Middletown	No	Minimum charge	Yes	Street sprinkling and fires	10	No
New London	No	Yes	Yes	All purposes	......	....
S. Manchester	No	Minimum charge	Yes	Hydrants	4	All but hydrants
Southington	No	Yes	No	....	......	All
Suffield	Tenants only	Minimum charge	No	....	......	Schools and fountains
Wallingford	....	....	Yes	Sprinkling and fire	......	Schools and public buildings
Willimantic	No	No	No	....	......	All but street and sewer flushing
Windsor Fire Dist.	No	No	No	....	2	All
Florida:						
Daytona	$5	$5[c]	Yes	Fire	5.5	All metered
DeLand	No	$3	No	....	⅓ or more	No
Ft. Myers	....	No	....	....	200,000 gal.	Yes
Orlando	Sometimes	No	Yes	Schools, bldgs., sewers, etc.	......	No
St. Augustine	No	No	Yes	Fire	15	Yes
Georgia:						
Americus	....	....	Yes	Sewers, Charity, etc.	25	Yes
Atlanta	No	No	Yes	All municipal uses	17	All
Lagrange	No	No	No	....	2	All
Milledgeville	No	No	Yes	Flushing sewers, public buildings and fountains	2	All
Thomasvillo	No	No	Yes	Street sprinkling, public building, hospitals, etc,	7	All schools
Tifton	....	....	Yes	Fire and public buildings	5	No
Waynesboro	No	$3	No	....	5	All
Idaho:						
Boise	No	No	No	....	2	All buildings
Lewiston	No	No	Yes	Sewers, streets, public buildings, parks, etc.	40	No
Twin Falls	Yes	No	No	....	2	No
Weiser	Yes	....	Yes	Fountains, schools and fire	25	One-half
Illinois:						
Bloomington	....	....	....	Fountains, flushing streets and sewers	......	....
Champaign	....	....	Yes	Buildings and fountains	Small	No
Downers Grove	....	....	Yes	Buildings and fountains	......	No
Flora	Yes	No	Yes	City Hall and sprinkling streets	......	No
Freeport	Yes	No	....	....	......	Schools
Lake Forest	No	Yes	Yes	Schools, buildings, sewers, fountains, etc.	......	Yes
Marshall	....	....	Yes	Boilers and fire	1	No
Mt. Vernon	If credit is poor	No	No	....	5	Schools
Mendota	....	....	Yes	Fire, sewers, sprinkling, fountains	......	15 to 20%
Paris	....	....	No	....	Very small	No
Peru	No	Minimum charge	Yes	Bldgs., schools and hospitals	......	All
Quincy	Non-owners	No	Yes	City Hall, engine houses, parks and hospitals	5	Schools, hospitals, parks
Rock Island	No	Scmetimes[e]	....	....	......	No
Watseka	Yes	No	Yes	City Hall, library, fountains	......	No
Indiana:						
Bedford	No	No	No	....	Very small	No
Brookville	No	No	Yes	Schools, City Hall and fountain	......	No
Delphi	No	No	Yes	School, library, fountains	10	No
Elwood	Yes	No	Yes	Churches, schools, city buildings, flushing streets and sewers, fountains and fire	......	No
Ft. Wayne	....	....	Yes	All city purposes	30	No
Goshen	No	No	No	....	......	5%
Knightstown	Yes	No	No	....	......	No
La Porte	No	No	....	....	5	In buildings
Lebanon	$2	No	No	....	5	In schools
Linton	No	No	Yes	Flushing sewers	......	All but sewers
Mishawaka	Yes	No	Yes	Streets and flush tanks	20	Schools
No. Manchester	Yes	No	No	....	25[b]	Schools
Peru	....	$6	No	....	10	No
Plymouth	No	Minimum charge	Yes	Street sprinkling, sewer flushing, fountains and fire	10[b]	No
Terre Haute	Non-owners	No	No	....	......	Yes
Tipton	No	Minimum charge	Yes	Public utilities	......	Schools
Vincennes	Yes	Yes	No	....	......	All

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a—Refunded in water; b—estimated; c—readiness-to-serve charge; e—rental charged when bill is less than $9 per annum.

plumb line into the barrel through a nozzle. Whether the hydrant connection is provided with a valve can ordinarily be learned only by finding the valve box, if necessary by digging a shallow trench from the hydrant toward the main, since in some instances of dirt or macadamized roads the valve box is pushed out of sight, when the ground is wet and soft, by the weight of wheels passing over it, and is later covered by dirt or stone and its presence forgotten. Cases are even known where a new pavement has been laid entirely covering such valve boxes, their presence not having been known.

The obtaining of information concerning valves is more difficult. If the street has been paved it must generally be assumed that all valve boxes show in the pavement surface: and yet the writer has found valves entirely covered with pavement and the presence of the valve unsuspected until a leak around the valve stem that showed on the surface caused an excavation to be made at this point. Having found a valve box, by removing the cover (and cleaning the dirt out of the valve box, if necessary) it is possible to measure the depth from the surface to the top of the pipe in which the valve is set. In some cases a pair of calipers may be used shaped like a pair of tongs and the outside diameter of the pipe measured; or the depth to the pipe and that to the top of the bonnet may be compared, giving the height of the bonnet, and a comparison with valves of different sizes in the stock room will generally enable one to determine from this the size of the valve. By the use of the wrench it may then be determined in what direction the valve turns to open, and the number of turns can usually be determined also. In case the stem cannot be turned easily, the valve needs attention anyhow (a valve that will not operate is worse than no valve at all), and should be dug down to and put in order: in which case all of the information desired, including the name of the maker, can be obtained.

In keeping the records, these may be placed in an ordinary notebook, each street being followed out consecutively from one end to the other; or a system of cards can be used, one card for each street intersection, filed in an ordinary card index; or the records may be kept in a loose-leaf ledger. The writer prefers the last named, since it permits adding new records and keeping all in order according to any desired system; with the additional advantage of considerably larger space which permits the recording of all information so as to be read easily and offers no excuse for the omitting of any details because of lack of room. Another minor disadvantage of the card index is that a card is frequently removed in order to copy information from it and a careless assistant may fail to return it to its proper position. There is, however, the advantage of the card index that in the case of a large city the loose-leaf records would occupy a large amount of filing space, and such records are more likely to be left out of the fireproof vault than would be the case with a card index wihich is always kept under fireproof conditions.

PROSPECT OF TRAFFIC IMPROVEMENT.

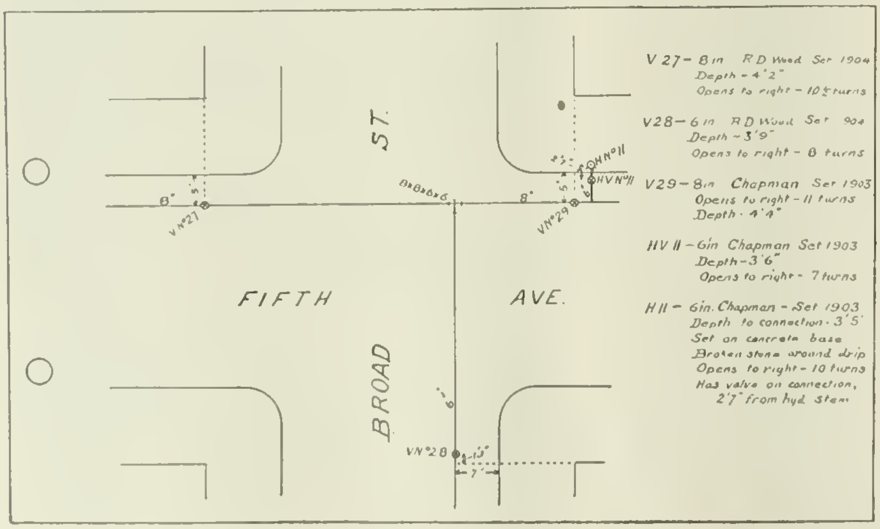
A few days ago Director General McAdoo placed orders for 70,000 freight cars, this being in addition to an order for 30,000 given a short time previous. About one-third of these are to be gondolas, which is the type of car used commonly for most road and other structural materials. This should help considerably in preventing car shortage next fall and winter; and a proportionate increase in locomotives will add to the relief. All of these will not, of course, be net gain, since numbers of both cars and locomotives are worn out and scrapped each year, and the number will probably be greater this year than ever because of the greater amount of traffic and other unusual conditions. The increase renders it probable, however, that traffic next winter will be limited by terminal facilities rather than by rolling stock.

Meantime conditions seem to be improving slowly, chiefly along the lines of deciding what services are most deserving of preference in the handling of freight. But there remains, and probably will continue to remain for months to come, urgent necessity for the maximum possible assistance by motor trucks using the highways.

RETURN LOADS IN NEW JERSEY.

We are informed by James Logan, president of the New Jersey Association of County Engineers, that at a special meeting on April 29th that association authorized him to appoint a "return loads" committee, which will meet weekly with other committees in connection with return loads and other motor-hauling matters, the meetings being held in Newark. President Logan appointed as this committee Garwood Ferguson, of Passaic county, chairman; J. L. Bauer, of Union county, and Ross McCave, of Bergen county.

The aim of the association, acting through this committee, is "to do its utmost by cooperation to relieve the present congested conditions in the vicinity of Philadelphia, New York City, etc."



V 27 - 8 in R D Wood Set 1904
Depth - 4'2"
Opens to right - 10½ turns
V28 - 6 in R D Wood Set 904
Depth - 3'9"
Opens to right - 8 turns
V29 - 8 in Chapman Set 1903
Opens to right - 11 turns
Depth - 4'4"
HV 11 - 6in Chapman Set 1903
Depth - 3'6"
Opens to right - 7 turns
H 11 - 6in. Chapman - Set 1903
Depth to connection - 3'5"
Set on concrete base
Broken stone around drip
Opens to right - 10 turns
Has valve on connection,
2'7" from hyd. stem
ST.
BROAD
FIFTH
AVE.
VN°27
VN°29
VN°28
HN°11
HVN°11
8"
8"
6"
7'

Sample page of a loose-leaf Valve and Hydrant record book (one-third actual size). Each sheet gives the location and description of all valves, hydrants and specials at one street intersection. The other side of the sheet is ruled, and on it is written a history of this part of the distribution system—repairs made to valves and hydrants, renewals, etc.

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Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

KEEPING MAIN HIGHWAYS OPEN.

Prominent recognition has been made of the work done by the Pennsylvania Highway Department last winter, in the form of a letter to commissioner J. Denny O'Neil from the Lincoln Highway Association, which it wrote to "express, as representing in a small way public opinion at large, our admiration of the public-spirited, patriotic efforts concentrated by your department upon the Lincoln Highway, in accordance with the request of the Council of National Defense and the Highways Transport Committee of that body, in keeping Pennsylvania's broad section of this main line of transcontinental motor traffic continuously open for the through passage of freight, both governmental and private. It would be difficult to estimate the measure of relief afforded our overburdened railways during the past winter through the transportation by motor truck of the thousands of tons of commodities which have moved across Pennsylvania." The work done by this state in snow removal we have already described.

Snow removal may seem an untimely subject just now; but on the other hand, the obtaining of funds for next winter's snow fighting is very timely, since the annual appropriations or allotments are being or have recently been made, and it is not too early—it may be too late—to obtain an adequate amount for next winter's work. But snow is not the only obstacle to traffic to be fought, and the intensive use of the main highways by motor truck traffic may be just as disastrously interfered with by wear as by snow drifts. State and county highway authorities have on hand a most important and perhaps difficult problem in keeping highways in good condition under the combination of unprecedented use and high cost and scarcity of labor and materials; but no duty has ever been more urgent or essential, and we believe that they will do it to the utmost of their ability—that they will find some way, even though present conditions make it appear impossible.

MAINTAINING WATER WORKS PROPERTIES.

Some municipal water works are decided successes, most of them give satisfactory service, but a few fall far short of what such a public utility should be and may be called failures even though they continue to operate. The same may be said of privately operated plants. Some of the causes of failures are suggested by the following letter received by us from the superintendent of a municipal plant in a western city:

> No man ever holds but two years, often but one, and sometimes gets disgusted and quits before one year is finished. Water system in 12 to 15 years; no system for repairing, testing or proving meters; if one stops going or is frozen up some plumber gets it, cleans and fixes it, blows in it and if it goes round puts it back and charges all the customer will stand. After being in a short time I have for two years urged the city to have their work properly done. I also want the city to divide the system into districts of not over four blocks, examine and test all gates; if none where one is needed, put one in; prepare for cleaning pipes if they need it after a thorough examination. Make a complete record showing location of all pipes, size and kind; all connections, size and kind; location of all valves of any kind, and all stop boxes for private systems, with a better system for location of meters. Put all pipes below freezing. To make a connection of large size or put in new hydrants in the greater part of the city, we must shut water off all over the city.

This city apparently has no real system, only some pipes with a few valves poorly placed. It has no records of what there is under ground, and as there have been a number of superintendents in rapid succession, it would be strange if any one now possesses such information. False economy in original construction and a continuation of the policy in the maintenance are indicated by scarcity of valves and failure to test the few in service. If the mains are gradually choking up and the valves are unserviceable, no one knows it. It may be expected that some day the city will wake up with a jolt to find that its system has failed it in an emergency—as in case of a large fire—and is fit only for the scrap pile.

A passenger steamer does not often need lifeboats and life preservers, but none is allowed to be without them, and every little while a catastrophe arouses inspectors and companies to a new realization of the necessity of keeping them in serviceable condition. Similarly, valves in a distribution system are not often needed, some may never be, but when they are wanted they are wanted badly and instantly, and they should not only be present in the system, but their exact location should be known and they should be in good working order. There should therefore be a readily-consulted record of them, and they should be tested at intervals to insure that they will be ready for service when wanted. In too many cities there are neither records nor systematic tests.

This is but one of the features of proper maintenance of water works properties. Others pertain to care of fire hydrants, pumping machinery, standpipes, reservoirs, purification plants, meters, etc. Superintendents should be supported and encouraged by water boards or directors in keeping the entire property keyed up to a high degree of efficiency; in fact, they should be required to do so. Periodical inspection, testing and overhauling should be considered an essential part of their duties; and the money for necessary up-keep should be provided even if it necessitates postponing extensions.

SEWER PIPE OBTAINABLE.

In our issue of April 13th we published a statement concerning the restriction by the government on the output of sewer pipe manufacturers, in which this restriction was said to be 50 per cent of the normal output. This information was received from a source which we considered reliable, but we have since learned that this was not the final decision of the administration. The director of conservation informs us that United States Fuel Administrator Garfield has made a definite ruling covering all vitrified clay, cement, or concrete sanitary sewer or culvert pipe, in sizes 42 inches in diameter or over, all drain tile and flue linings, that no manufacturer shall use fuel of any description in connection with the manufacture of such products to an amount exceeding 75 per cent of the average amount consumed at such plant for those purposes during the years 1915, 1916 and 1917; except that individual manufacturers may obtain permission for a larger production from the fuel administration should it deem it desirable to grant it on the ground that the necessities of the government require such greater production, or in case the fuel administrator of the state certifies that the additional amount of material is required in connection with building operations of urgent public necessity.

It does not seem probable that this restriction will in any way interfere with the carrying out of any contemplated projects this year, since it does not seem probable that such projects will be proposed exceeding in amount 75 per cent of normal years. Moreover, it is quite possible that it will be difficult to obtain transportation facilities for even this amount, and it is probable that if there should be any restrictions upon the amount of pipe that the cities of the country can obtain for use this year, such restriction will be imposed by the limitations of the transportation facilities of the country and not by those placed on the manufacturers.

TURNING GARBAGE INTO DOLLARS.

Advantages of Hog Raising—Answering Objections to Garbage Feeding—Cost of Plant—Proper Location and Care Necessary.

The Extension Division of the University of Wisconsin has issued a bulletin on the utilization of garbage, in which it urges all communities in that state to make unusual effort to collect all of the garbage from the homes of its citizens and to use it in the raising of pigs. An increase in the amount of pork raised in the country would be a most important factor in the solution of the food problem; but, aside from this, there would seem to be opportunities for considerable profit from the raising of swine. Says the bulletin referred to: "Hogs are quoted at $17.50 per hundred pounds on foot at present, so that a gain of 200 pounds represents a saving of $35 per hog as fed on the garbage produced by forty-five people."

"The consensus of opinion among unbiased sanitary engineers and garbage disposal experts is that garbage can be and is being fed in a sanitary manner, without danger to public health and at a very distinct profit." In average times, the garbage from 50 people is sufficient to fatten one hog each five months. Assuming that food conservation has reduced the amount of garbage by 50 percent, we have one hog fattened to a value of $35 for every hundred people in the community.

The bulletin summarizes much of the information which has previously appeared in the Municipal Journal concerning the raising of hogs, and in addition discusses objections that have been raised to it and suggestions for carrying out the plan, which are quoted herewith.

"*Objections to Garbage Feeding.* The feeding of garbage has been unduly condemned for the following reasons:

"(a) There is a popular belief that the feeding of garbage endangers the public health. This belief is not founded on the facts. It should be stated that, contrary to popular belief, human diseases are in all probability not transmitted through garbage feeding. The sanitary problem, then, concerns not so much the health of man as the health of the hog.

"(b) Garbage feeding plants have in the past been pretty generally mismanaged from a sanitary standpoint, but the system should not be condemned on this account. Garbage feeding plants can be made sanitary. Many cities in the United States are now successfully feeding garbage to swine without injury to the public health. More than 90 per cent of all the hogs raised in the State of Massachusetts are garbage fed, and the Massachusetts State Board of Health is most efficient, at all times demanding the best results.

"(c) The hog has been generally condemned as a filth-loving animal. This is far from fair to the hog who is naturally a tidy animal. Owing to the fact that a hog perspires only on a very few spots on his body and that he is overfed to force fattening, quite naturally he becomes hot and seeks the handiest place available to cool off. If the proper place is provided for wallowing, and plenty of shade is at hand, the hog will keep clean. It is true that the conditions under which some pigs have been fed and fattened have been not only a disgrace to the community but decidedly unfair to the hog.

"(d) Complaints of the bad odors have been made against garbage feeding piggeries, yet where proper precautions are taken there is no more objection to feeding garbage than to feeding grain or other hog food.

"*Cost of Plant.* The cost of establishing a piggery and conducting it on a scientific basis depends so primarily upon local conditions that even generalities and estimated costs are of little value. However, a fully equipped and properly constructed plant for 500 hogs can be built for about $4,000.

"*Caution.* Any municipality or individual who plans to utilize garbage in the feeding of hogs must constantly bear in mind that to maintain an establishment of this kind without creating a nuisance, the plant must first be properly located, and secondly, properly cared for at all times.

"The state law provides that whenever a nuisance shall be found on private or public property, it must be abated. The State Board of Health and the local boards of health have full authority to abate such nuisances.

"Therefore if the feeding of garbage is undertaken, it must be done in a proper location and under adequate supervision at all times. The services of an expert should be sought in every case when new plants are installed. There are many garbage-feeding plants throughout the state which are conducted in such a manner as to raise no objection whatever, whereas in a number of other localities it has been necessary to order the business discontinued on account of the nuisance created.

"*Selling Garbage.* In many cases it will no doubt be better to sell the garbage direct to licensed farmers. This can be arranged by the city making its own collections and hauling the garbage to a conveniently located transfer or loading bin. The loading station should be so designed as to make it possible to keep it in a sanitary condition and to make loading and unloading economical. An attendant should be in charge of the loading station at all times so that a record of the garbage sold may be properly kept. He should be held responsible for the sanitary conditions at the transfer station.

"This plan will be especially effective in the solution of the garbage problem of the smaller cities, and in fact a plan worthy of consideration in most cities, since it can be quickly and cheaply installed and does not demand the services of experts who are most essential in the effective operation of a community piggery.

"*Where to Feed.* The garbage feeding should be carried on either at a well located piggery outside the city limits and on land suited to the purpose or on certain farms outside the city limits. It is not intended to convey the idea that the "keep a hog" idea is urged on the town people. Nothing could be further from the purpose of this bulletin. Hogs in no case should be fed inside the city limits, and where fed outside the city limits the stations should be so located and conducted as to prevent complaints."

IRRIGATING WITH SEWAGE AT TUCSON.

Nearly Five Hundred Acres of Arid Farm Land Can Be Watered—Seventeen Years of Experience By the City.

By W. C. LEFEBVRE.*

After approximately seventeen years of more or less experimentation, Tucson, Arizona, located in the midst of an arid desert, this year will be able to water four hundred and eighty-three acres of surrounding farm land through the use of its sewage water and reap a financial reward from the sale of the water of about $10 per acre per year.

The sewage water is practically clear and little or no odor comes from the land. The land may be sowed any number of times during a year. It does not wear out, but continually improves, as the experience of seventeen years has shown.

All of the lands receiving the water will, of course, be developed to forage crops. Results have shown that it is possible to produce seven tons of alfalfa to the acre (five crops), sorghum four tons per acre, barley hay, three tons.

The price of the water service is fixed by the city ordinance at a minimum of three dollars per acre a year, since there would be six irrigations per year at least.

Of the total area that can be irrigated, 108 acres will be owned by the city and operated as a city farm for the production of feed for the market and for the city stock. This leaves 375 acres under private ownership that can be taken in on irrigation.

It was about seventeen years ago that Tucson first paid heed to the dry farmers of the district and began the practice of using sewage for irrigation, on ten acres of city farm land. The farmers received none of the benefit, but the city did. From that time up to the present the system progressed irregularly until there are now one hundred and thirty-six acres of city land under irrigation.

In its collection of sewage, Tucson uses the "separate system," that is, a system which carries house sewage only. Up to the first of January, 1918, the city had sixteen miles of lateral sewers. The sewage collected by these was used to irrigate sixty acres of land lying at the edge of the city. The water delivered to this farm during 1917 was 276 million gallons. This was about 23 per cent of the amount of water pumped into the city by the city water works. A large part of the percentage lost, amounting to more than three-quarters of the total volume delivered to the city, was apparently used in the irrigation of lawns and city parks, which generous use was largely due to the small percentage of water users metered, which was between 25 and 30 per cent.

After passing through the city sewer system, the sewage enters the distributing canal at the city farm. Here it enters a three-compartment settling tank, with grates at inlet and outlet, which catch paper and large foreign matter. The sewage then enters an open dirt ditch from which it is distributed over the city farm.

A problem was presented by the fact that half of the area to be irrigated was on the opposite bank of the dry Santa Cruz river. The problem of carrying the water was solved by constructing an inverted syphon six hundred feet long, of vitrified sewer pipe. Recently this has been replaced by eighteen-inch corrugated iron pipe with joints of canvas, covered with asphalt, under the standard joint strips.

During 1917, with sixteen miles of lateral sewers, the irrigation distribution system received 276 million gallons of water; during 1918, with 32 miles of lateral sewers, sixteen miles of which was constructed in 1917, it was figured there would be a seventy-five per cent increase, for the business section of the city had already been sewered. This gave a total delivery for irrigation purposes of 483 million gallons of water delivered at the outfall. This would be sufficient to irrigate 483 acres of land on the basis of one million gallons of water per year to each acre of land. On this basis there would be enough water to irrigate 375 acres of land more than the city has at present and it is this surplus that the city contemplates selling.

The demonstration of the success of irrigating with sewage emboldened the city in recent years to invest in 120 acres of dry lands, three and a half miles north of the city, in advance of the increased supply of sewage to come from the recently constructed sewer on the north side. This land has been gradually cleared during 1917, and at the beginning of the present year seventy-six acres were under cultivation on this new farm. The application of the sewage to this new farm has been along the lines of the previous practice.

The new farm is connected to the old sewage system by means of a thirty-inch reinforced concrete pipe line. Along this line are nine manholes of standard four-foot diameter type and five weir manholes with mechanically operated gates. The pipe line is laid at a depth of eight feet below the surface and the water brought to the surface by means of the weir manholes.

The dry bed of the Santa Cruz river runs through the middle of this new farm, as well as the old farm, and to carry the water across it, twelve hundred feet of thirty-inch line was built as an inverted syphon, giving a ten-pound pressure on this part of the line.

Problems of cleansing the sewage, presented by the irrigation of the original city farm, were solved in the connection of the new farm. It has been found that, even with the use of settling tanks and grates, the land gets more or less paper from the sewage and the odor is unpleasant in the summer months. In the new farm irrigation, however, it has been noted that after traveling three and a half miles through the pipe line, the paper is dissolved and the sewage is practically clear, giving little or no odor after irrigation has been effected.

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*City Engineer of Tucson, Arizona.

The WEEK'S NEWS

Federal Regulation of Road Building and Financing—Highway Developments in Pennsylvania and New Jersey—Wisconsin's State Regulation of Water and Sewerage Systems—New York's Drastic Venereal Disease Law—No Meters for Phoenix Suburbanites—Electric Rate Increases in Indiana Cities and Boston—Shortage of Firemen in Canton, O.—New York's Police Reorganization—The War Finance Corporation—Michigan City, Ind., Has "Alien Enemy" Mayor—Garbage Disposal in Schenectady and Springfield, Ill.

ROADS AND PAVEMENTS

Federal Regulation of Roadbuilding in Southwest.

Fort Worth, Tex.—J. D. Fauntleroy, district engineer of the United States Department of Agriculture, Office of Public Roads and Rural Engineering, has sent out the following letter to the various state highway departments in his district: "In regard to the submission of future Federal aid projects, I am of the opinion that many bond issues which have been voted will not meet the approval of the Secretary of the Treasury, and that therefore project statements which have been submitted wherein it is intended to finance the construction by means of money raised from bond issues will be held up indefinitely and will cause blank numbers to appear in the list of projects for your state. I therefore most strongly urge that you do not submit any more project statements to this office where bond issues are involved unless the bonds have already been voted and sold. I also suggest that in recommending project for Federal aid that you show preference to those projects whereupon the materials to be used will not have to be hauled by railroads; that is, such materials as stone, gravel, shell, etc. It is not believed that there will be any difficulty in securing the transportation by rail of cement, oils, asphalt, steel, iron, pipes, etc."

State Abolishes Road Tolls.

Harrisburg, Pa.—The state highway department has announced that the Lancaster, Elizabethtown and Middletown turnpike and the Lancaster and Williamstown turnpike, in Lancaster county, have been purchased by the state. The purchase price of the former was $68,000, and of the latter $90,000, and in both instances local authorities cooperated with the state. The Lancaster and Williamstown turnpike is twelve miles long and is a section of the Lincoln highway. For many years the citizens of Lancaster county have urged the abolition of tolls from these important thoroughfares. When the Lincoln highway was established in 1913, tolls were encountered only upon the Pennsylvania section of the route, and an energetic campaign has been waged ever since to eliminate them. Some short mileages of toll road still remain, but plans are well under way for their being taken over. During the past six months approximately 138 miles of toll roads have been taken over by the state.

Paving Dispute Ends in Compromise.

Dubuque, Ia.—Forestalling expensive litigation and ending a controversy that has lasted more than a year, involving the county board of supervisors, contractor Donald Jeffrey, his bonding company, the National Surety company of Chicago, and his trustee in bankruptcy, H. B. McCabe of this city, an amicable settlement has finally been reached. Under the terms of the agreement, the bonding company paid to the county of Dubuque the sum of $6,500. The machinery used by contractor Jeffrey, under the settlement, will be left on the road until the work is completed at which time it will be returned to the bonding company which will dispose of it. It is more than three years now since the Hawkeye road improvement was inaugurated and the contract let to Donald Jeffrey. The original plan called for the expenditure of about $75,000, but shortly after the work was started it was seen that the cost would amount to $50,000 more than that sum. The county was to assume the greater share of the cost, although $30,000 of the sum was to be received from a federal road fund. The Hawkeye Improvement Association, formed here, was also to assume part of the burden. Over a year ago it was seen that the contractor would suffer loss if he completed the work under the original contract. Uncertain weather conditions, labor troubles and other incidents tended to delay the work and increased the cost of pushing the work to completion. Finally contractor Jeffrey surrendered his contract and filed a petition in bankruptcy. A trustee was then appointed. The latter attempted to push the work ahead for a time, but it was realized soon that the bonding company would have to assume entire liability. The conference at which the agreement was reached was the result of earnest efforts on the part of county and state officials to settle the matter without litigation.

Government Refuses Bond Issue Approval.

Chicago, Ill.—The Capital Issues Advisory Committee of the Federal Reserve Board has notified county superintendent of public service, Henry Zender, that it will not allow the sale of the million-dollar bond issue voted last fall. The Department of Agriculture advised the local committee that there is not sufficient agricultural necessity for the roads, and the War Department asserted that there is not sufficient military value to justify building them. This bond issue was to have been used in the construction of 48 miles of road along five routes northwest, southwest and south of the city. Road construction in the county will therefore be confined to work on contracts already let.

New Jersey's Highway War Plans.

Trenton, N. J.—The policy of the administration in adjusting the state road program to meet extraordinary conditions brought about by the war has been outlined by Governor Edge in a comprehensive report showing what has been done and will be done in the near future toward the development of a highway system. The report was prepared by state highway engineer W. G. Thompson at the request of the Governor. It shows that the plan for the current year takes into consideration the enormous increase in cost of supplies and equipment and also the request of the federal government that unnecessary construction work throughout the country be deferred for the present. That convict labor will be liberally employed in road work in order not to impair the efficiency of essential war industries is indicated in the report, which shows also that approximately $445,000 will be allotted to the various counties as state aid and that motor vehicle funds amounting to $1,600,000 will be distributed during the year for repair and maintenance of roads. Said Governor Edge: "The tremendous increase in the price of everything is a condition which the state, as well as individuals, must meet. It will be foolish to go ahead and undertake at once the building of all roads contemplated for normal times in these days when everything has advanced and much of our capital which can be used to advantage later on would be wasted." In the report of engineer Thompson accompanying the governor's statement the various improvements to be undertaken this year are outlined in detail. "Subsequent to submitting of the report on preliminary survey of the entire system, the commission, after careful analysis of the situation relative to the needs of commercial traffic and the national military establishment, selected for this year's work unpaved sections of nine of the state highway routes. The engineering department immediately started detailed surveys and preparations of plans and specifications. Reasonable bids are hoped for; it will, however, be the policy of the commission to reject all bids should they be deemed excessive, and such work as cannot be performed at reasonable cost, considering abnormal economic conditions, will be deferred until conditions are more favorable. Work is to be immediately resumed and pushed to completion on the Georgetown-Wrightstown road, which was started last fall with convict labor. The work now under way with convict labor in Sussex County is to be completed early this season, after which all convicts are to be employed on the state highway system. The first allotment of federal aid for New Jersey, approximately $59,000, will be used by Salem County in conjunction with state aid and county funds raised by bond issue, for the paving of Malaga-Penns Grove road, which will connect State Highway Route No. 6 at Woodstown with Wilmington Ferry at Penns Grove. The 1917-1918 allotment of federal aid, approximately $118,000, will be expended with state funds on the construction of portions of Routes No. 4 and No. 13." Mr. Thompson tells of the deterioration of the roads leading to Camp Dix and Camp Merritt last fall and how the state took up the repair of these highways, which was temporarily abandoned during the winter, but was resumed on April 15, and which is now being completed. So satisfactory was the work done by reformatory inmates on the Camp Dix road that this labor is to be used on the road between Menlo Park and Rahway, while the convict force now located in Sussex County will be utilized on the mountain section of Route No. 9 at West Portal. In connection with his announcement of funds to be distributed to the counties as state aid, Mr. Thompson says: "Many of the counties have instituted a regular patrol system, by which men are assigned to certain sections of roads and supplied with materials of which their particular section is constructed; thus, by constantly watching for breaks or faults in the pavement and condition of drainage, repairs are made at once, before serious breaks occur. The system, when adopted by all counties, will greatly reduce cost of maintenance and insure better traveling conditions generally. In all of the work referred to in the foregoing report which contemplates the use of free labor, opportunities will be afforded contractors to submit bids and if the estimates are not too high, the contracts will be awarded."

SEWERAGE AND SANITATION

Dealers Claim Milk Regulations Unconstitutional.

Portland, Me.—Claiming that the proposed new by-law of the board of health which makes it incumbent upon non-producing milk dealers to have their milk pasteurized and to lessen their bacterial count to 50,000 per cubic centimeter, is contrary to the 14th amendment to the Constitution of the United States, eight such dealers have brought a bill in equity in the United States district court at Portland seeking to have the board of health restrained from putting this by-law into operation. The procedure is an interesting new step in the milk controversy which has been waged here since the board of health announced this by-law. Originally the matter was brought to a focus by protests against the tuberculin test, which had been made imperative in the case of both non-producing and producing dealers. Pasteurization was proposed as an alternative to the tuberculin test in the case of dealers who did not control the sources of their own supply, but was combatted by such dealers on the ground that the expense of installing pasteurization plants would be so great as to take away the profits of their business. Proponents and opponents of the tuberculin test and of pasteurization presented their viewpoints at a number of hearings. Meanwhile in accordance with statute the proposed by-law was submitted to Justice George E. Bird of the supreme court, and was approved by him. Allegations in the bill are that the new by-laws is a violation of the Constitution of the United States; that it violates the police powers of the state in that its regulations are unreasonable and unjust; that its enforcement will cause serious injury to the plaintiffs; and that it will produce a multiplicity of suits. Accordingly they ask the court to prevent the enforcement of the by-law until there has been a hearing on the merits of the case. The clauses in the by-law to which the dealers take exception are those defining Grade B milk. According to the provisions of the by-law milk which has been tuberculin tested, has not over 100,000 bacterial count and is bottled and distributed by the producer, is classed as Grade A milk and the cream derived from such milk which has not over 500,000 bacterial count as Grade A cream. Grade B milk shall mean milk, all of which is produced by healthy cows, as determined by physical examination within not exceeding one year previous by a qualified veterinarian, which shall not at any time prior to pasteurization contain more than 500,000 bacteria per cubic centimetre, and after pasteurization and prior to delivery to consumer not more than 50,000 bacteria per cubic centimetre. Grade B cream as defined by the by-law means cream derived from Grade B milk, which shall not at any time prior to pasteurization contain more than 1,000,000 bacteria per cubic centimetre and after pasteurization and prior to delivery to consumer not more than 200,000 bacteria per cubic centimeter.

State Sanitary Regulation in Wisconsin.

Madison, Wis.—Investigations with a view to developing purer water supplies and improved sewage disposal and drainage facilities in many Wisconsin centers were made during the first quarter of 1918, according to a report just filed by E. J. Tully, state sanitary engineer. Well waters were found contaminated at Baldwin and treatment was recommended. A public sewer system was advised as the only permanent solution. At Oshkosh extensive surveys were made at the city's new filtration plant, and additional chemical treatment advised and other changes suggested. A system of charts for recording the daily data was outlined. Pollution of the well water used in the town of Lake, Milwaukee county, was disclosed and steps advised for preventing its continuance. At Stevens Point an investigation was made to ascertain the influence of industrial waste discharged from the Mosinee Paper company's plant on the quality of the public water supply. Recommendations were made for purification of the river water used as a public supply by a system of sand filtration and use of aluminum sulphate and installation of filtration units at the Mosinee paper plant. Well water pollution was discovered at Phillips and preventive measures recommended. Sewage treatment and disposal investigations were pursued at Oconomowoc, West Allis and Wauwatosa, and industrial waste problems combatted at North Milwaukee, Milwaukee, Mattoon and Mosinee. Stream pollution investigations were conducted at Mud Creek, North Milwaukee; Kinnickinnic river, West Allis; Milwaukee river; Mosinee and Stevens Point; Elk river and Druray's lake, Phillips; Red Cedar river, Colfax; and Mattoon. Plans for a public sewer system were approved for West Allis, Lake Mills and Cadott and plans for sewer systems were taken under advisement for Campbellsport, River Falls, Portage and the township of Neenah.

Drastic Health Law to Protect Soldiers.

New York, N. Y.—A health law, described as being the most drastic ever enacted in any state in this country, which was passed by the legislature at Albany at the request of the federal government for the protection of soldiers and sailors, has gone into effect. It provides for the arrest and detention during treatment of persons afflicted with venereal diseases. Officials of the health department were sent to the Night Court for the purpose of enforcing the law, the administration of which is placed by the law mainly in the hands of the health department. Health commissioner Copeland said that this was a wonderful law and that the part which the federal government had played in its enactment foreshadowed a time when the federal health department would control and direct the work of local health departments in all cities. The law resembles the Page act, which was in effect some years ago until it was declared unconstitutional by the state court of appeals. The law was held to be class legislation because it applied to women only, but the new Whitney act applies equally to men and women. The health department intimated that arrests would be made under this act at the beginning at the rate of twelve a night. The prisoners will be held for a diagnosis. After that only those will be held who are suffering from a communicable form of the diseases specified in the act. They will be held in city hospitals, or may be released at the discretion of the health authorities upon guarantees that they will receive treatment. Those who are detained will be kept in hospitals for the necessary period until they cease to be likely sources of contagion. The federal health authorities have turned over to the department of health a list of "suspects," who have been named by soldiers who have been questioned at army hospitals. The complaint may be made by any person, soldier or civilian. It was announced at the health department that men were to be arrested as well as women.

WATER SUPPLY

Must Stop Free Use of Water.

Canton, O.—Findings totaling $2,790 are made by state examiner Moul in a report on the Canton waterworks department for the year ending March 31, 1918. The findings are practically all of a technical character and are along lines which have been touched on before in previous reports of the state on this department. The examiner lists the value of free water furnished illegally by the department at $2,304 and points out that the law specifies what institutions and departments shall be furnished free water. Much of the free water went for the flushing of streets and he advises that this free use of water contrary to the law be stopped. Findings totaling $1,074 for water furnished the schools, hospitals and the public library at a price of 30 cents per 1,000 cubic feet, where 52½ cents per thousand cubic feet should have been charged, are made by the state examiner. Of this sum, $773 is apportioned between former service director Starrett and the various institutions, and $301 is divided between service director DeCorps and the schools and hospitals. The report states that at the time it was completed there were about 15,000 water consumers. Of this number 1,600 were on meters and the balance were paying for their water by a flat rate. The clerks and various officials having to do with the management of the department are commended by the examiner.

Consumers Out of City Need No Meters.

Phoenix, Ariz.—Consumers of city water who reside outside the city limits of Phoenix do not need to install meters and pay for the water at a measured rate, but may continue to pay the flat rate in force for several years. This decision, which is of much interest to the several hundred people who live outside the city limits of Phoenix and who are consumers of city water, was made by the state corporation commission and settles a matter that has been in controversy for more than a year. The particular complaint against the city was filed with the corporation commission on January 12, 1917, by D. B. Harrer. Mr. Harrer, who lived outside the city limits, had for a long time been a consumer of city water at a flat rate. The pipe line from the city limits to his residence had been installed at his own expense. The city, early in 1917, notified these outside consumers that they must install meters at their own expense. Harrer objected, and on January 12, 1917, the pipe line running to his residence was disconnected by the city. He immediately made formal complaint to the corporation commission. The city, answering the complaint, insisted that under the constitution of the state, municipal corporations were exempt from the jurisdiction of the corporation commission. The case was heard in March, the commission holding that the city in serving water beyond the city limits subjected itself to the provisions of the constitution and statutes of the state applicable to public service corporations and ordered it to continue service to the complainant. It was urged by the city that under its "Home Rule" charter it was authorized to extend its municipal activities outside the city with respect to furnishing water. The commission ruled that if the city elected to carry on the business of serving water outside the city it must do so as a private corporation. It was stated at the hearing that at that time there were about 5,100 consumers of water within the city and 290 outside. It was the desire of the city, it was stated, to change from a flat rate to meters, because residents outside the city were in many cases using the water for irrigation purposes, contrary to the law, they being out of reach of criminal prosecution by the city. It was ordered that, effective on or before April 25, 1918, the city shall reinstate the rates, rules and regulations in effect for the service of water to customers outside the city limits of Phoenix prior to the change whereby customers were required to install meters at their own expense necessary to serve them. It was also ruled that the city violated the law in changing rules and regulations in effect without authority of the corporation commission.

Company Must Pay for Excess Diversion.

Trenton, N. J.—Liability of the East Jersey Water company to pay for water in excess of that diverted by the company from the Passaic river at Little Falls at the time of the passage of the excess diversion act in 1907 has been established by the supreme court in an opinion filed by justice Bergen. The decision affirms the action of the state Department of Conservation and Development in assessing both the East Jersey and Acquackanonk water companies for excess diversion during the last half of 1915 and the year 1916. The important point decided is that the exemption granted by the act of 1907 included only so much water as the East Jersey and other companies were legally diverting at that time. The East Jersey claimed a right to exemption for further diversions on the ground that it was under contract to supply various municipalities and was legally authorized to do so. Such a construction of the law, justice Bergen pointed out, would render the statute practically inoperative. Justice Bergen stated the rule governing excess diversion in the syllabus of his opinion as follows: "The words of the statute, 'now being legally diverted,' mean the amount being diverted according to law in 1907, when the act went into effect, and do not extend to a quantity which, by contract, the corporation may subsequently require to supply increased needs of those with whom it has contracted to supply water. An abstractor may take what it was in 1907 diverting, and, if that did not reach the statutory maximum exemption, as much more as is required to make the total maximum diversion allowed without payment of the license fee. If in 1907 the daily diversion exceeded 100 gallons per capita, the amount then diverted may be taken without payment, and if it was less, no license fee can be imposed until it exceeds the statutory quantity."

STREET LIGHTING AND POWER

Commission Allows Rate Increases.

Indianapolis, Ind.—Inasmuch as coal and power-house labor constituted a larger proportion of the cost of electric current sold at low rates for power than of cost of current sold at higher rates for domestic and commercial use, it is just to provide for necessary increases in revenue by a surcharge on power rates alone, it was decided by the Indiana public service commission. The stand was taken in two decisions, one granting a surcharge of 5 mills for electric power rates in Elwood, Alexandria, Orestes and rural districts adjacent, and the other granting a surcharge of 4 mills for power rates in Marion, Jonesboro, Gaston, Matthews, Upland, Sweetser, Summitville, Fowlerton, Gas City and rural districts adjacent. A large industrial district in Indiana is affected by the surcharges. G. I. Sellers & Sons Company protested against the proposed surcharge in the Elwood case, and argued that any increase should be borne proportionately by domestic and other consumers as well as by industrial plants. This company, which would have to pay 1.25 cents a kilowatt hour, or a 46 per cent. increase under the new rate, threatened to put in a plant and produce its own power if the surcharge were granted. The Indiana General Service Company serves Elwood, Alexandria, Orestes and adjacent rural districts in which a surcharge of 5 mills a kilowatt hour is granted, and the Marion Light and Heat Company serves Marion and other places in which a surcharge of 4 mills a kilowatt hour is granted. The Marion company asked for a surcharge of 5 mills. The essential points of the decision in the Elwood case, which is for the most part the same as in the Marion case, are presented in a syllabus. Some of the points, in addition to the one already given, are as follows:

> "The possibility of an increased volume of business during the present fiscal year does not insure a corresponding increase in net income, since labor and materials will be correspondingly higher. Increased cost of producing power due to war prices of materials and labor should not be met by drawing on surplus accumulated largely from profits on domestic and commercial rates. In considering a proposed surcharge, the existence of low power rates elsewhere enjoyed by competitors of the power users affected is immaterial. Where power users enjoy unusually low rates the revenue made necessary by increased war costs should be provided by a surcharge on power rates. A utility should not be compelled to sell current at an actual loss to business concerns, engaged like itself, in business for profit. Where a utility has become largely an industrial power plant, power users should bear a larger proportion of its cost of operation. Since increased cost has largely been anticipated by purchasers of power and collected from customers in the form of higher prices a surcharge on power rates is just. Since demands for increased supply of current and additional power facilities come largely from power users, the cost of maintaining the credit of the utility at a point where it can obtain the necessary capital should be borne by power users."

The surcharge in the Elwood case begins with April 1 of this year and runs until further order of the commission, but in no event more than ten years. The same time provisions apply to the Marion case.

Gas Rate Increase Authorized.

Boston, Mass.—The commonwealth gas and electric light commission has authorized the East Boston Gas Company, supplying that section of Boston and the city of Chelsea, to increase its price from 80 to 95 cents per thousand feet for the duration of the war. "During a period of such exceptional and unprecedented costs," says the board in its order, "it has seemed expedient and just to grant such temporary relief as the circumstances warrant." Should it be shown after the war that 95 cents is an excessive rate, it will be reduced by the commission.

Long Cable Span in Norwegian Power Plant.

Stavanger, Norway.—According to consular reports the power transmission line from Florli to Stavanger was recently completed and is ready for service, awaiting only the completion of the power plant at Florli. This will make 12,000 horsepower available for the Stavanger Electric Co., to be used for lighting and power. The line is built with copper cable stretched on wooden trestles, with spans of 250 meters (273.4 yards), and has a capacity of 50,000 volts. Hogsfjord is crossed by a single span, with a length of 1,384.2 meters (1,513.76 yards), said to be the longest in the world. The span is composed of three cables of crucible steel, since copper or aluminum would not be able to stand the strain. Copper-sheathed cable would have been preferable to prevent loss of voltage, but under present conditions it could not be obtained. Each cable has a diameter of 16 millimeters (0.63 inch), is composed of 19 strands, and has tensile strength of 150 kilos per square millimeter (330 pounds per 0.00155 square inch), and a total of about 22 metric tons for the whole cable. A sufficient margin of safety is thereby secured, as in calm weather a strain of 4 tons is exerted on the cable between the two terminals, which increases to 7 tons in a high wind. The slack of the cable is 80 meters (87.5 yards), and in a strong wind will oscillate 50 meters (54.7 yards). To prevent contact of cables the masts are built 15 meters (16.4 yards) apart. The land framing the fjord at this point being elevated the masts are only 7 meters (23 feet) high, but the distance from the water's edge to the lowest point in the slack of the cable is 40 meters (43.7 yards), therefore no interference is offered to shipping. Insulation of the cables at their terminals is secured by four ordinary upright insulators for each cable.

FIRE AND POLICE

Close Fire Station Because of Man Shortage.

Canton, O.—One district fire station has been closed by fire chief Mesnar and another station probably will be closed shortly because of the shortage of men in the fire department. The department had 46 men working while 60 men are provided by city ordinance and during the vacation period opening May 1 the department will be short about four more men during the summer, or will be operating on a force of 42 men and officers. The closing of the station followed a conference between chief Mesnar and safety director Hamaker. There should be four men at the station closed, but there were only three and one of these left the house, leaving two firemen. One of the two remaining went home on account of sickness, the chief says. The machine was brought to headquarters for the present. This station will probably be reopened and will be one which has a pump shut so the pump could be used from the central station. All efforts of officials and the civil service commission to get firemen to take jobs at the present rate of pay have proved unavailing. There are plenty of applicants for police jobs, but only three men took the firemen's examination recently, and these men were working under provisional appointments. Three cadets in the fire department have quit during the past three weeks.

Fire Sweeps Island.

Bay Shore, N. Y.—An uncontrollable fire swept along Fire Island Beach, destroying six houses and razing board walks and some summer shelter houses in Fire Island State Park. A five-mile stretch of beach hills was blackened clear out to Point of Beach, where the Fire Island Inlet stood as a barrier against further damage. The crew of the Fire Island coast guard station, a detachment of fourteen men from the Bay Shore naval air station, and boatmen and beachmen for miles around fought the fire for about seven hours. A cottager at Saltaire started a fire in the morning to burn rubbish and the tall, dry beach grass took fire. The strong prevailing east wind soon got the flames beyond control, and they licked westward at an alarming rate. After a group of buildings had been left a heap of ruins an attempt was made to backfire, but this also got beyond control. Sweeping past the telegraph and wireless stations and the Fire Island lighthouse, the blaze attacked the State Park with consuming fury, leveling a long stretch of boardwalk and destroying summer houses. The Inlet prevented what might have been a conflagration. This stretch of water was all that stood between the raging flames and the thickly-settled summer colony on Oak Beach.

Police Reserve and Training Forces Organized.

New York, N. Y.—Special deputy police commissioner Rodman Wanamaker has announced his detailed plans for the organization of the Police Reserve Force, which the Hylan city administration is forming to merge with and take the place of the Home Defense Corps organized by mayor Mitchel. There will be two distinct divisions of the force, according to deputy commissioner Wanamaker's plans. One will be the Police Training Corps, which young men will enter with the intention of graduating eventually as full-fledged policemen, while the other will be a civilian reserve divided into neighborhood and business units, the men in which will be called upon only for emergency duty and to qualify as reserve patrolmen or for special services in the mounted, harbor or air reserve. All the men swearing in will be required to sign a pledge to obey all orders. The members of the force will have uniforms, provided by the city, and will wear badges. There will be officers, non-commissioned officers and privates, and promotions will be made according to ratings in examination and work. "The Order of Liberty" will be established as an honorary degree, and medals will be given to those qualifying. There will be three grades to the order, signified by bronze, silver and gold medals. The training corps, from which men will be trained to enter the regular uniformed force, will be recruited particularly from young men between the ages of 18 and 28, who, according to Mr. Wanamaker's regulations, "are not liable to be called to service by the Federal Government in the immediate future." All applicants for this corps must be examined by a police surgeon for the purpose of determining whether their physical condition comes up, or can be built up, to the standard requirements of the municipal civil service commission, and no applicant will be admitted who is not qualified physically. The members of this corps must attend training classes in the evening as directed and those who do not make reasonable progress are to be dropped. The training provided is to be the same as that provided for candidates for the regular force. The members of the regular force are to be recruiting officers for this corps. All police stations will accept applications to be forwarded to the department commanders. Mr. Wanamaker explains that this system will save the city much money in the training of the future policeman because these men will be graduated as ready for active duty, whereas at present the city has to pay the salaries of men during a three months' training course after they have been accepted by the city and placed on the city payrolls.

GOVERNMENT AND FINANCE

Federal Board Controls Financial Operations.

Washington, D. C.—The first step in the organization of the $500,000,000 Government War Finance Corporation, the biggest institution of the kind ever created, was taken when President Wilson nominated four directors who, with Secretary McAdoo, will conduct the work of aiding in financing essential war enterprises. At the same time, the President nominated seven members of the new Capital Issues Committee, which will replace the Federal Reserve Board's Capital Issues Committee, in exercising a voluntary regulation of securities issues of more than $100,000. The Finance Corporation Directors nominated by the President are W. R. G. Harding, Governor of the Federal Reserve Board; Allen B. Forbes, New York, private banker and securities dealer, member of the present Capital Issues Committee's advisory sub-committee; Eugene Meyer, Jr., New York banker and business man, member of the National War Savings Committee, and connected with the War Industries Board, and Angus W. McLean, banker and lawyer, of Wilmington, N. C. Mr. Forbes declined the nomination. Members of the new Capital Issues Committee were named as follows: Charles S. Hamlin, member of the Federal Reserve Board, former assistant secretary of the treasury; John Skelton Williams, controller of the currency, and director of finance and purchases of the railroad administration; Frederic A. Delano, member of the Federal Reserve Board; Henry C. Flower, Kansas City banker; Frederic H. Goff, Cleveland banker; James B. Brown, banker, of Louisville, Ky., and John S. Drum, San Francisco banker and lawyer. Mr. Hamlin and Mr. Delano are members of the present Capital Issues Committee, and Mr. Flower and Mr. Goff are members of the advisory sub-committee. Paul M. Warburg, now a member of the Capital Issues Committee, was not appointed on the new body, so that his time may be free to manage affairs of the Federal Reserve Board, much of whose work will fall on him as vice-governor, because of governor Harding's appointment on the War Finance Corporation. The organization of the big corporation with a half billion dollars' capital, furnished by the government, and with authority to issue $3,000,000,000 bonds, is considered the most important development in the financial history of the country since the formation of the Federal Reserve Board a few years ago. It will establish virtually a pool of the nation's investment resources, to be drawn upon to maintain war industries and businesses. The corporation will use the Federal Reserve system extensively for administering its huge financial transactions, and through Mr. Harding there is effected an interlocking directorate between the Federal Reserve Board and the corporation. On the Capital Issues Committee, Mr. Williams will represent the interests of railroads whose securities ordinarily form a large proportion of the securities floated annually. In addition, he will represent the national banking system in his capacity as Controller. The existing Capital Issues Committee, since its organization three and one-half months ago, has developed an extensive system of examining the merits of proposed security issues, through the co-operation of sub-committees in each Federal Reserve district, composed of bankers and business men acting as volunteers, and this machinery probably will be used by the new organization. The committee in the last three and one-half months has approved new issues aggregating $103,000,000, and refunding obligations which did not involve issuance of new capital amounting to $238,000,000, and has disapproved $44,000,000. In addition, arrangements were made informally for the postponement of more than $8,000,000 securities, and many millions were frowned upon by the district subcommittees and thus prevented from going on the market.

The Capital Issues Committee recently adopted the following resolution: "Effective immediately, this committee reduce from $500,000 and over to $100,000 and over the minimum of security issues of industrial and public utility corporations that it will consider." This action is taken by the committee in furtherance of its policy heretofore expressed of adapting its methods to those prescribed for the guidance of the Capital Issues Committee created by the War Finance Corporation Act which, in section 203, provides that the committee may consider applications of $100,000 and over. The committee has heretofore observed the $100,000 minimum only with respect to municipal issues. Its action will tend to relieve the embarrassment of those desiring to issue at this time securities, the aggregate of which is above the minimum prescribed by the statute and yet below the minimum heretofore considered by the existing committee.

Adopt Commission Form.

Weatherford, Tex.—Commission form of city government has been adopted here at a special election. The vote was 261 for the new charter and 234 against it.

Councilman Convicted of Accepting Bribe.

Youngstown, O.—A verdict of guilty was returned by the jury in the trial of William F. Mehlo, city councilman on an indictment charging acceptance of a bribe in connection with a franchise grant to the Workmen's Transit company a recently organized jitney bus corporation on a second count charging solicitation of a bribe. Six other city councilmen await trial on similar charges. The verdict was returned after five hours deliberation. Attorneys for Mehlo stated that a motion for a new trial will be made.

"Alien Enemy" Mayor Arrested in Washington.

Michigan City, Ind.—Frederick C. Miller, mayor of Michigan City, was arrested as an alien enemy when he came to Washington, D. C., to discuss prospects of completing his naturalization as an American citizen. He was later released and allowed to depart for home. Miller said he came to this country with his parents when 5 years old and that his father became a citizen long before the mayor reached the age of 21 years. Political enemies, he asserted, started the report that the Charles Miller who obtained citizenship papers was not his father, and he took out first papers with a view to removing any doubt as to his citizenship. He is serving his third term as mayor. He became mayor of Michigan City last January after a futile attempt in the federal courts to prevent him from taking office on the ground that he was not a citizen . Secret service men had been advised that Miller was en route to Washington. They followed him from the railroad station to a hotel and arrested him as he was registering. Miller is also subject to internment for having violated the presidential order that enemies may not leave their homes without permit. "What am I if I am not an American? I certainly am not a German," said Miller. "My life and my actions must speak for themselves. My loyalty cannot be questioned. Even if I had a roomful of naturalization papers my patriotism could not be more sincere than it is now."

STREET CLEANING AND REFUSE DISPOSAL

To Investigate Operation of Garbage Plant.

Schenectady, N. Y.—An expert investigation of the garbage disposal plant is to be made at a cost of $500 to determine why the plant is falling back in its rate of production, and when the trouble is located a contract will be entered into with the C. O. Bartlett and Snow Company of New York City to make what changes are necessary. This was determined at a meeting of the board of estimate and apportionment at the request of commissioner of public works S. M. Bishop. The commissioner has an available $500 in his budget which will defray the cost of the expert. The examination and recommendations will be made by H. H. Bighouse, a garbage plant expert connected with the Bartlett and Snow Company. Commissioner Bishop told the board the garbage plant now is consuming three times as much gasoline as other plants of its size and type are using; that it is producing but forty-eight pounds of grease from each ton of garbage as against an average production of from sixty to sixty-five pounds, and that it is constantly losing tankage by having to take out the crusher. The loss to the city from the falling off in grease returns alone, the commissioner said, amounts to $5,000 a year.

Private Garbage Collections Save City Money.

Buffalo, N. Y.—Councilman Arthur W. Kreinheder has sent a letter to the mayor, explaining that the private collection of garbage is not mulcting the city out of revenue, but is saving it about $15,000 a year, and for that reason it has not been discouraged. He says: "At the present time we have a contract for the disposal of our garbage with the International Agricultural Corporation at the rate of $1 per ton. We are well aware that private collectors are collecting garbage not only in the tenth precinct, but in every precinct, and have never attempted to stop them for the reason the less garbage we deliver to the garbage destruction plant the less we have to pay; secondly, there is less garbage for us to transport, and, thirdly, because we understand that this garbage which is collected by private concerns is fed to hogs. It is our understanding that the United States government is desirous of utilizing every pound of garbage which is collected, and also that the government is heartily in favor of feeding hogs with garbage as this helps to conserve our food supply. We estimate there are approximately 5,000 tons of garbage per year collected by private concerns. You can readily see if we collected this ourselves it would mean an additional expense of close to $15,000, as transportation and disposal would have to be figured."

Permanent Injunction Against Rendering Plant.

Springfield, Ill.—The question of the disposal of dead animals is put up to the city of Springfield by the granting of a permanent injunction against the operation of the rendering works northwest of the city. The injunction was granted by judge Frank W. Burton as the end of the litigation arising from the case of four taxpayers against the city of Springfield and the operators of the plant. A bill for injunction was filed in the circuit court on February 24, in which it was set up that operating under a lease from the city which owns the ground on which the fertilizer plant is situated the operators were maintaining a nuisance and a menace to the health of the people residing in the vicinity of the plant. Incidentally a complaint was made against the Town Branch sewer smells. The master in chancery to whom the case was referred approved the Town Branch sewer, but declared that the fertilizer plant must go. After exceptions to the master's report had been withdrawn and attorneys for the operators had signified their withdrawal from the case as counsel, judge Burton signed the decree of injunction. The city of Springfield and its officers and employees are enjoined from leasing the ground or the fertilizer plant to any one for the purposes for which it has been used in the past. The plant has been closed since the temporary injunction of February.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Recall Election—Charter Provisions—Signatures.

(Cal.) Any person elected or appointed to office under city charter is presumed to accept same with condition that his tenure may be terminated at any time in manner prescribed in such charter.—Baines v. Zemansky, 168 P. 565.

(Cal.) Const., art. 11, §8½, par. 4, conferring "plenary authority" to provide for "recall and removal" of officers, makes it competent for charter to provide that an officer have sole jurisdiction to decide sufficiency of petitions for recall.—Baines v. Zemansky, 168 P. 565.

San Francisco Charter, art. 11, c. 3, construed as a whole, gives registrar of voters exclusive final jurisdiction as to sufficiency of petition for recall as to legal requirements and whether signatures are genuine, and he must make a determination in fifteen days.—Id.

Although under San Francisco Charter, art. 11, c. 3, relating to recall, inquiry as to genuineness of signatures to petitions for recall is limited by section 3 to call in voter, officer being recalled can question genuineness of signature and have voter notified.—Id.

Water Pipes—City Ownership—Sale.

(Ga.) Where water pipes were acquired and held for special non-governmental purpose the city, when it had no further use for them, could lawfully convert them to another use or dispose of them.—City of Gainesville v. Dunlap, 94 S. E. 247.

Provision of amendment to charter of city of Gainesville (Acts 1892, p. 168, §2) held not to prohibit city's sale, under duly adopted ordinance, of certain water pipes laid by it as part of its water system and subsequently abandoned.—Id.

Legislative Control—Street Railway—Franchise—Fares.

(Mass.) Legislature may modify or annul city's grant of location of street railway to maintain tracks on bridge without violation of any constitutional provision.—City of Fall River v. Public Service Commission, 117 N. E. 915.

Under St. 1898, c. 578, §11, where location of tracks on bridge granted street railway was not original location neither company nor successor was required to reimburse city for expenditures in making repairs of roadway, though it was condition of grant of location that railway should repair.—Id.

Under St. 1913, c. 784, Public Service Commission properly permitted Bay State Street Railway Company to discontinue sale of tickets over Slade's Ferry Bridge at Fall River at rate of six for twenty-five cents, though rate over bridge had been made condition by city of grant of location.—Id.

Payment of Street Sweeper—Mayor's Signature.

(Mo. App.) Under Rev. St. 1909, §9226, whereby a city of the third class can only pass an order of council with the mayor's concurrence an ordinance not signed by the mayor was void.—Baker Mfg. Co. v. City of Richmond, 198 S. W. 1128.

(Mo. App.) Where an ordinance was absolutely void because not signed by the mayor there could be no ratification or estoppel on the part of the city.—Baker Mfg. Co. v. City of Richmond, 198 S. W. 1128.

Where an ordinance authorizing the purchase of a street sweeper and a grader was absolutely void because not signed by the mayor the fact that the council paid for the grader did not ratify the contract.—Id.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

Roads and Streets.

Principles of Design:

Purely Theoretic Super Elevations Modified for Roads. Slight distance ability to stop, and safety for horses, will limit banking on curves. Slower speed desirable. By W. S. Downs. 1 ill., 1,000 words. Engineering News-Record. April 25. 20 cts.

Chart for Laying Out Curves by Tangent Offset. For field work use of highway engineers. By B. R. Keller. 1 ill., 400 words. Engineering & Contracting, April 3. 15 cts.

Standard Reversed Curve for Jogs in Main Highways. Illinois adopts design for improved roads at points where section-corner corrections make dangerous offsets. By C. M. Hathaway. 1 ill., 1,000 words. Engineering News-Record, April 25. 20 cts.

Safety Provision on California Mountain Highways. The "Day Lighting" curves, by cutting berms to increase the distance drivers can see ahead, make blind turns safer. 1 ill., 500 words. Engineering News-Record, April 4. 20 cts.

Operating Cost of Highways. Consideration of effect of surface upon tractive force and of this upon cost. By A. N. Johnson, consulting engineer, Portland Cement Assn. 1,200 words. Cement and Engineering News, April. 25 cts.

Principles of Road Construction. Abstract of report of committee of Amer. Soc. of Civil Engrs. Selecting paving material. Grade, width, thickness, drainage, foundations, joints, cushion course and finishing surface. 3,200 words. Municipal Journal, April 20. 10 cts.

Efficiency in Road Drainage. The need for better construction and maintenance of culverts and small bridges. By N. B. Garver. 3 ills., 1,400 words. Good Roads. April 20. 15 cts.

Bases:

Considerations Affecting the Design of Pavement Foundations. By H. J. Fixmer. 2,000 words. Municipal Engineering, April. 30 cts.

Bituminous and Broken Stone Bases. Letter from Harry E. Devereaux, citing instances of cracks over such bases. 1 ill., 200 words. Municipal Journal, April 20. 10 cts.

Highway Construction:

The 1918 Highway Construction Projects of Several States. Reports from State Hwy. Comms. of several States. 5,000 words. Engineering and Contracting, April 3. 15 cts.

County Highway Work Performed During 1917. Data furnished expressly for these tables by county highway officials in all sections of the country. Amount, nature and cost of each kind of road construction in each county. 7 pages. Municipal Journal, April 20. 10 cts.

Road Work During 1918. Amounts that the highway authorities of the several states expect to lay during the present year. How the funds will be raised. Effect of war conditions on road program. 3,500 words. Municipal Journal, April 20. 10 cts.

Kansas Roads. Brief description of work done in that state. 1 ill., 1,000 words. Better Roads and Streets, April. 20 cts.

Maintenance:

Roads Maintenance and Automobile Fees. Fees received by Maryland Road Comm. not sufficient to maintain highways. 1 ill., 700 words. Municipal Journal, April 20. 10 cts.

Maintenance and Necessary Revenue for State and State Aid Roads. Cost of maintaining Maryland roads and revenues available. By Frank H. Zouck, Chm. Maryland State Roads Comm. 12 ills., 2,500 words. Better Roads and Streets, April. 20 cts.

Motor Equipment for Highway Maintenance Work. Light trucks and trailers combine the advantages of the patrol with the economy of the gang system. By W. R. Farrington. 3 ills., 1,200 words. Engineering News-Record, April 4. 20 cts.

Maintenance Required Under Federal Aid Act. Brief explanation of requirement. By J. C. Carpenter, U. S. Hwy. Engr. 1,800 words. Southern Good Roads, April. 15 cts.

Uniform Maintenance Cost-Records for Roads Adopted in Washington. Recent legislation having allocated sufficient funds, also regulates their expenditure and demands that county authorities keep all primary roads up to state standards. By Geo. F. Cotrell. 2,800 words. Engineering News-Record, April 4. 20 cts.

Accounting.

Uniform Methods of Road Construction Accounting Desirable. Variety of systems now in use makes comparisons of cost practically impossible. Items should be separated according to the nature of the operation. Equipment and perishable tools account. By Edw. N. Hines. 3,000 words. Engineering News-Record, April 11. 20 cts.

Maintenance Accounting in Washington. Uniform cost estimates and reports on county work under the State Hwy. Dept. 3 pages. Good Roads, April 13. 15 cts.

County Highway Records. Desirability that county officials keep detailed records and cost data. 500 words. Municipal Journal, April 20. 10 cts.

Uniform Road Accounting. Abstract of paper presented at Univ. of Michigan by Edw. N. Hines, Chm. of Wayne County Road Commrs. 600 words. Canadian Engineer, April 4. 15 cts.

Bituminous Pavements.

Method of Constructing Asphaltic Concrete on Dundas St., York Co., Ontario. Detailed description of the work. 5 ills., 2,400 words. Engineering & Contracting, April 3. 15 cts.

Long-Lived Coal Tar Pavements at Washington, D. C. List of such pavements. 1,000 words. Engineering & Contracting, April 3. 15 cts.

The Physical Condition of an Asphalt Pavement an Important Factor in Determining the Resistance to Traffic. By C. L. Cook. 700 words. Engineering & Contracting, April 3. 15 cts.

Bumps and Waves in Bituminous Sheet Pavements. By W. L. Hempelman. 1 ill. 1,400 words. Municipal Engineering, April. 30 cts.

Application of Bituminous Materials for Surface Treatments on Gravel and Broken Stone Roads. Paper before American Assn. for the Advancement of Science. By Julius Adler. 3,500 words. Better Roads & Streets, April. 20 cts.

Oil Embargo Threatens Destruction of Roads Worth Tens of Millions. A letter from Col. Sohier of the Mass. Hwy. Comm., and editorial comment. 1,300 words. Municipal Journal, April 6. 10 cts.

A Louisiana Road for War-Time Traffic. Connecting Alexandria and Camp Beauregard. Five per cent. limiting grade necessitates considerable grading. Warrenite laid on broken stone base. Mixtures used. Eliminating grade crossings. Difficult pier construction. 6 ills., 1,400 words. Municipal Journal, April 20. 10 cts.

Concrete Pavements.

Methods of Curing Concrete Pavements. Ponding and covering with earth in Logan, Utah. 2 ills., 800 words. American City, April. 40 cts.

Construction Plant and the Methods Employed in Building Concrete Roads in Wayne County, Michigan. 8 ills. 3,000 words. Municipal Engineering, April. 30 cts.

Street Paving at Boulder, Colorado. Method of constructing concrete crub and gutter and concrete pavement. By H. E. Phelps, Asst. Prof. of Civil Engineering, Univ. of Colorado. 3,000 words. Engineering and Cement World, April 15. 15 cts.

Suggested Specifications for Roller Finish. 4 ills. 400 words. Engineering and Cement World, April 1. 15 cts.

How to Inspect Concrete Paving. Practical suggestions concerning all parts of the work by F. E. Semon, City Engr. of Port Angeles, Wash. 1 ill., 2,500 words. Concrete, April. 25 cts.

Wood Block Road Joints. Use of wooden strips between slabs of concrete pavement. By P. L. Brockway, Asst. City Engr. of Wichita, Kans. 1 ill., 700 words. Concrete, April. 25 cts.

New Features in Concrete Pavements. Hand roller and canvas belt. Eliminating waves. Resurfacing with concrete, hydrated lime, expansion joints and measuring aggregates. 1,600 words. Municipal Journal, April 27. 10 cts.

Concrete Roads on Steep Grades. Methods of construction employed by New York State Hwy. Dept. 1 ill., 600 words. Municipal Journal, April 20. 10 cts.

Laying Concrete Pavement in Freezing Weather. Method employed successfully last winter at Ft. Oglethorpe. Thawing sub-grade. Warming at night with lanterns under canvas. 800 words. Municipal Journal, April 6. 10 cts.

Brick Pavements.

Using Home-made Equipment on a Small Monolithic Brick Pavement Construction Job. By Fred R. Charles. 700 words. Municipal Engineering, April. 30c.

Study of Fillers for Street Pavements. Brief discussion of both bituminous and cement fillers. By Karl C. Kastberg, City Engr., Des Moines, Iowa. Engineering and Cement World, April 15. 15 cts.

Wood Block.

Recommended Procedure in the Construction of Wood Block Pavements. By Lambert T. Ericson. 1 ill. 1,000 words. Municipal Engineering, April. 30 cts.

Dust Preventives.

Progress Reports of Experiments in Dust Prevention and Road Preservatives, 1916. From bulletin of U. S. Dept. of Agriculture. 7,500 words. Better Roads and Streets, April. 20 cts.

Streets.

The Cost of Wide Streets. Discusses 150-ft. street in small Arizona city and unnecessary expense involved. 600 words. Municipal Journal, April 13. 10 cts.

Grade Crossing Elimination at Passaic. Obtaining property. Avoiding damage claims. Grading with heavy and light steam shovels. Mixing and delivering concrete. Sewer reconstruction. Cost of the improvement. By R. F. Odell, Bur. of Engrg., Passaic, N. J. 5 ills., 2,200 words. Municipal Journal, April 27. 10 cts.

Traffic.

Traffic Laws and Highway Maintenance and Construction. Wheel loads supportable by different soils. Diminishing unit pressure. Limiting truck weights. Width of tires. State requirement. By Chas. C. Brown. 2,400 words. Municipal Journal, April 20. 10 cts.

Traffic Laws and Highway Maintenance and Construction. Destructive effect of speed on different kinds of roads with different tires and loads. Uniformity of speed regulations. Second installment. By Chas. C. Brown. 1,700 words. Municipal Journal, April 27. 10 cts.

For Federal Encouragement of Highways. Resolutions adopted by Highway Traffic Assn. of the State of New York. 1,100 words. Municipal Journal, April 20. 10 cts.

Miscellaneous.

Imperfect Back Filling Cause of Much Damaged Pavement. Plumbers more at fault than corporations, who take every precaution. Competent inspectors are expensive but needed. By Geo. S. Nobles. 1,000 words. Engineering News-Record, April 18. 20 cts.

Importance of Inspection of Paving Materials. By Messrs. Morgan, Campbell & Nolte. 1,200 words. American City, April. 40 cts.

Road Ditches Death Traps. Plea for substituting underground drains for side ditches. 400 words. Southern Good Roads, April. 15 cts.

Methods and Cost of Constructing and Maintaining Secondary Roads in Southern California. General construction method for oiled earth roads. By E. Earl Glass. 4 ills., 1,800 words. Engineering and Contracting, April 3. 15 cts.

Contract or Day-Labor Construction. Figures concerning the extent of road work done in the different counties of the country by day-labor. 400 words. Municipal Journal, April 27. 10 cts.

Interesting and Instructive Experiment with Convict Labor for Roads. Government operated camp in Georgia demonstrated under adverse conditions the efficiency and economy of the honor system. 4 ills., 1,000 words. Good Roads, April 27. 15 cts.

Road Organization. Suggestions for organizing the force for construction and for maintenance. Paper before Ontario Good Roads Assn. By F. A. Senecal. 1,600 words. Municipal World, April. 15 cts.

Stones Suitable for Crushing. Those available in each of several eastern and central states. 2,400 words. Stone, April. 25 cts.

The Creation of a More Equitable Contract Between Highway Comms. and Contractors. Paper before the American Road Builders' Assn. by James C. Travilla. 3,500 words. Better Roads and Streets. April 1. 20 cts.

Oklahoma Road for $1.30 per Yard. Description of work on the Jefferson Highway. 7 ills., 700 words. Concrete, April. 25 cts.

Military Roads Imperative Necessity. Lessons drawn from experience in European countries. By Col. Wm. D. Sohier, Chm. Mass. Hwy. Comm. 2,000 words. Southern Good Roads, April. 15 cts.

Ontario Highways. Describing classification of roads and apportionment of government aid. Annual address by C. R. Wheelock, C. E., Pres. Ontario Good Roads Assn. 2,000 words. Municipal World, April. 15 cts.

Consideration Leading to Recommendations for Fine Screens, Sprinkling Filters, Humus Tanks and Sludge Recovery as Sewage Disposal Method for Indianapolis. Abstract of paper before Indiana Sanitary and Water Supply Assn., by Geo. W. Fuller. 4,200 words. Engineering and Contracting, April 10. 15 cts.

Sewerage and Sanitation.

Sewer Construction.

Present Tendencies in Sewer Construction and Design. By H. K. Barrows. 5 ills., 2,500 words. Municipal Engineering. April. 30 cts.

Estimating Contractors' Overhead Costs in Sanitary Sewer Construction. With data from actual experience. Paper before Iowa Engineering Soc., by Stanley D. Moore. 400 words. Engineering and Contracting, April 10. 15 cts.

Protection Table Used on Shield for Sewer Tunnel. Designed for constructing two miles of 6-ft. concrete sewer. Temporary lining of timber cants. 3 ills., 400 words. Engineering News-Record. April 4. 20 cts.

Sewage Treatment.

New Sewage Treatment Plant at Xenia, Ohio. By W. J. Sherman. 5 ills., 1,000 words. Municipal Engineering, April. 30 cts.

Specific Suggestions on the Design of Imhoff Sewage Settling Tanks. By Charles F. Mebus. 1 ill., 2,000 words. Municipal Engineering. April. 30 cts.

Experiences with Imhoff Tank Foaming Told by Sewage Works Operators. Engineers and chemists at Fitchburg, Schenectady, Rochester, Atlanta and Columbus sum up difficulties. How overcome, and give opinions as to causes. Good sludge digestion and removal of first importance. 2,000 words. Engineering News-Record, April 4. 20 cts.

Operation of Sewage Works in Iowa. Recommendation relative to septic tanks, Imhoff tanks, sludge beds and intermittent sand filters. General suggestion for operating plants. Second installment. 4 ills., 4,000 words. Municipal Journal, April 6. 10 cts.

Operation of Sewage Works in Iowa. How to secure proper operation of plants. Supervision by designing engineer. Directions for operators. Third installment. By J. H. Dunlap. 4 ills., 2,500 words. Municipal Journal, April 13. 10 cts.

Suggestions on the Design and Operation of Sewage Treatment Plants. Abstract of paper before Iowa Engineering Soc. by Prof. J. H. Dunlap. 2,500 words. Engineering and Contracting, April 10. 15 cts.

Small Town Sewage Works Operation Problems Analyzed. Results of inspecting plants in 39 cities in Iowa presented to engineers of state by Prof. J. H. Dunlap. 2,300 words. Engineering News-Record, April 18. 20 cts.

Miscellaneous.

Concrete Sewer Pipe. Experience of the use of such pipe in San Diego, Cal. By A. E. Dodson. 700 words. Concrete, April. 25 cts.

Distinctive Characteristics of Institutional Sewerage. Design too often based on municipal practice. Data on quantity of sewage, variation in flow, effect of latter on sewer design, and quality of sewage in relation to treatment. By Henry W. Taylor. 3,600 words. Engineering News-Record, April 25. 20 cts.

Waterloo's Sewage Pumping Stations. Description of three small plants, cost of same, and experience in operation. Motor driven, automatically stopped and started. 1,000 words. Municipal Journal, April 6. 10 cts.

Sewers a War Necessity. Editorial giving reasons why cities should continue necessary sewer work. 800 words. Municipal Journal, April 13. 10 cts.

Water Supply.

Pumping.

Centrifugal Pumps of St. Paul Water Department. Test of electrically operated plant with capacity of fifteen million gallons a day. Single-stage centrifugal pumps used. 1,500 words. Municipal Journal, April 6. 10 cts.

Modifying Centrifugal Pump for Direct Motor Connection. Limitations of Induction Motor Speeds May Necessitate Changing Pump Characteristics. By B. B. Jackson. 1 ill., 400 words. Electrical Review, April 13. 30 cts.

The Air-Lift Pumping System. General description by A. W. Swan. 1,000 words. Canadian Engineer, April 4. 15 cts.

High Efficiencies of Motor-Driven Water Works Pumps. Test of two electric pumps at McCarren pumping station in St. Paul. 1 ill., 2,000 words. Electrical Review, April 27. 30 cts.

Purification.

Water Purification in the Canal Zone. Spraying removes odors and free carbonic acid. Change in point of application of alum lengthens filter runs. 2,000 words. Municipal Journal, April 13. 10 cts.

Improving Quality of Meridian, Mississippi Water Supply. By M. L. Worrell. 1,500 words. Municipal Engineering, April. 30 cts.

Getting Chemicals for Treatment of Water in Ohio. State Dept. of Health aided water works. Federal cooperation obtained. 800 words. Engineering News-Record, April 25. 20 cts.

Liquid Chlorine Treatment Inexpensive. Detailed figures from two New York Cities. 600 words. Canadian Engineer, April 25. 15 cts.

Emergency Use of Portable Chlorine Sterilization Plants. Description of work done by New York State Dept. of Health. By E. Sherman Chase, Asst. Engr., Division of Sanitary Engineering. 1,100 words. Engineering and Contracting, April 10. 15 cts.

Construction.

The Sinking and Lining of Large Bore Wells for Public Water Supplies. English practice in methods and materials. By W. H. Maxwell. 3 ills., 4,500 words. Water and Water Engineering, March 20. 20 cts.

Reconstructing Water Plant Without Interrupting Service. Ft. Madison, Ia., replaces old pumps, boilers and buildings with new, one item at a time. Also builds storage reservoir and filtration plant, and new river intake. 5 ills., 2,500 words. Municipal Journal, April 13. 10 cts.

Reconstruction of Ft. Madison Water Works Plant Without Interruption of Service. Pumping plant, building, and intake replaced by new during winter weather. 3 ills., 2,000 words. Fire and Water Engineering, April 17. 15 cts.

Fort Madison Water Works Rehabilitated by Citizens' Corporation. Pumping plant rebuilt, purification provided, new intake, duplicate force and reinforcing mains laid. Distribution system extended and universal metering begun without interrupting service. By R. E. McDonnell. 1 ill., 1,500 words. Engineering News-Record, April 18. 20 cts.

Testing Water Mains in Trenches. American practice described in an English paper, "The Surveyor." By R. O. Wynne-Roberts. 1,200 words. Canadian Engineer, April 25. 15 cts.

Service Pipe Corrosion.

Corrosion of Service Pipes. Investigation of effect of water treated in rapid filtration plants upon galvanized iron and lead pipes. Low alkalinity and free carbonic acid removes galvanizing. Low alkalinity required by high temperature. 3 ills., 1,600 words. Municipal Journal, April 6. 10 cts.

Pipe Corrosion in Domestic Service. Results of an investigation in Pittsburgh. 500 words. Engineering and Cement World, April 1. 15 cts.

Thawing Frozen Pipes.

Method of Thawing Service Pipes with Electric Current. Suggestions made by Hydro-Electric Power Comm. of Ontario. 3 ills., 700 words. Engineering and Contracting, April 10. 15 cts.

Duluth Water and Light Dept. Freezing of water and gas mains. High prices increase cost. No extensions on ungraded streets. Assessing extension costs. 900 words. Municipal Journal, April 6. 10 cts.

The Cost of Electrically Thawing Water Mains at Lawrence, Kans. 500 words. Engineering and Contracting, April 10. 15 cts.

Electrical Thawing of Water Pipes. Description of method employed at Trenton, Ont. By Fred C. Adsett. 1,100 words. Canadian Engineer, April 11. 15 cts.

The Profit to a Water Dept. from Thawing Frozen Service Pipes. 500 words. Engineering and Contracting, April 10. 15 cts.

Dams and Reservoirs.

Multiple-Arch Dam Construction in California. Method of calculating and description of two California dams by J. F. Springer. 10 ills., 5,500 words. Engineering and Cement World, April 1. 15 cts.

Middle Section of Upstream Side of Calvareras Dam Slips into Reservoir. Part of clay core also goes, and 230-foot outlet tower topples. Estimated that slide involves 800,000 of 2,800,000 yards placed to date. First problem now to open buried outlet culvert. By Allen Hazen and Leonard Metcalf. 5 ills., 2,500 words. Engineering News-Record, April 4. 20 cts.

Tumalo Irrigation Storage Reservoir Leaked Profusely and Erratically. Engineering and geological investigation of site last summer at cost of less than $5,000 would have saved the state of Oregon a loss of nearly $200,000 if made before beginning reservoir construction. By J. P. Newell. 1 ill., 2,700 words. Engineering News-Record, April 18. 20 cts.

Great Concrete Reservoir Built with Portable Mixers. Structure above ground has counterfort walls with unsual expansion joints. Holds 45,000,000 gallons, materials delivered by industrial track. By E. J. Lieber. 4 ills., 2.200 words. Engineering News-Record, April 11. 20 cts.

Why Some Irrigation Canals and Reservoirs Leak. Unsuspected subterranean cavities cause settlements when water is turned in. Experiences in half a dozen far western states outlined. By A. P. Davis. 1 ill., 2,500 words. Engineering News-Record, April 4. 20 cts.

Method of Repairing Revetment of Belle Fourche Dam. Concrete blocks on earthen dam displaced by wave action. By B. E. Hayden. 2,000 words. Engineering and Contracting, April 17. 15 cts.

Miscellaneous.

Flow Capacity of Water Pipes. Instructions and diagram for calculating capacity. By C. F. Wagner. 1,000 words. National Fire Protection Assn. Quarterly, April. 50 cts.

Trenton Water, Sewer and Garbage Depts. Service satisfactory under municipal ownership. 1.500 words. New Jersey Municipalities, April. 25 cts.

Water Supply Problems of Chicago. General recital of difficulties encountered, by Bureau of Public Efficiency. 3,000 words. Fire and Water Engineering, April 10. 15 cts.

The Greater Winnipeg Water District. General description of project of bringing water from Indian Bay, a distance of 96.5 miles. By C. S. C. Landon. 3 ills., 5,000 words. Canadian Engineer, April 4. 15 cts.

The Greater Winnipeg Water District. Second installment. By C. S. C. Landon. 5 ills., 2,500 words. Canadian Engineer, April 11. 15 cts.

Annual Report of the Water Dept. of Bangor, Me. From report of Supt. M. A. Sinclair. 3 ills., 2,000 words. Fire and Water Engineering, April 10. 15 cts.

Annual Report of the Water Dept. of Duluth. Revenues, use of meters, extension of mains, etc. 1,600 words. Fire and Water Engineering, April 24. 15 cts.

Annual Report of the Water Dept. of Detroit. Complete report of Superintendent Leisen. 1 ill., 2,500 words. Fire and Water Engineering, April 3. 15 cts.

Street Lighting and Power.

Method of Improving Power Plant Economy. Reiteration of principles involved in efficient combustion of coal with suggestions as how this end can be attained. 1,500 words. Electrical World, April 13. 15 cts.

Practical Measures for Securing Greatest Economy in Utility Power Plant Operation. Second installment. By Chas. Bressman. 2,500 words. Municipal Engineering, April. 30 cts.

Government Specifications and Tests for Incandescent Lamps. New specifications available for other purchasers, such as central stations. Accelerated tests. 1,400 words. Electrical Review, April 27. 30 cts.

Economizing in Street Lighting. Adopting lamps, globe, reflector and other details to secure maximum illumination of street surface with minimum of current. 6 ills., 1,200 words. Municipal Journal, April 27. 10 cts.

New Station of Kansas City Light & Power Co. Work being pushed on large and efficient plant to overcome power shortage. Ultimate capacity to be 150,000 kilowatts, of which 50,000 are being installed in two units. 3 ills., 1,700 words. Electrical Review, April 20. 30 cts.

Lincoln's Lighting Department. Current furnished for street and domestic lighting. Incandescent lamps replace carbon arcs. Cost of street lighting reduced. 700 words. Municipal Journal, April 6. 10 cts.

The Boston Street Lighting Division. Editorial comment on rate case before Mass. Gas & Electric Lt. Comm. 1,000 words. Electrical Review, April 20. 30 cts.

Linking Up Rural Communities in Iowa. Transmission line economics and centralized generation enable scattered settlements to have electricity supply. 6 ills., 3,000 words. Electrical Review, April 6. 30 cts.

Mapping and Recording Distribution and Transmission Systems of Gas Companies. A discussion of methods employed and a suggested method. Keeping and cost of various features. Record forms. By C. E. Steller. 10 ills., 1,800 words. American Gas Engineering Journal, April 20. 10 cts.

Street Cleaning and Refuse Disposal.

Snow Plow on Motor Truck Bucks Four-Foot Drifts. Mold board constructed of 2x4 surfaced with twenty-gage sheet-steel. Spreader at rear levels ridges. By F. P. Stott. 2 ills., 500 words. Engineering News-Record, April 14. 20 cts.

Rotary Disc Plow for Snow Removal. Developed last winter by the Chicago South Park Commrs. 2 ills., 400 words. Engineering and Contracting, April 3. 15 cts.

Methods and Cost of Snow Removal Work by South Park Commrs., Chicago. Itemized records of areas and costs on three separate days. 2,000 words. Engineer and Contracting, April 3. 15 cts.

Methods and Cost of Snow Removal. Experience of South Park Commrs. of Chicago. By H. F. Richards, Supt. 2,000 words. Canadian Engineer, April 18. 15 cts.

Device for Roughening Snow-Packed Sidewalks. Used in Ottawa, Ont. 1 ill., 50 words. Engineering and Contracting, April 3. 15 cts.

The Lighting of New York City's New $3,000,000 Garbage Disposal Plant. By A. L. Powell. 3 ills., 1,800 words. American City, April. 40 cts.

Motor Trucks in Snow Removal Work in Loop District, Chicago. Last Winter's Work by the Street Dept. 800 words. Engineering and Contracting, April 3. 15 cts.

Miscellaneous.

Bridges.

Concrete Encased Plate Girder Bridge of Unusual Design. Description of a plate girder structure with shallow floor, on account of limited clearance over Philadelphia and Reading Railway tracks at Cambria St., Philadelphia, by Albert M. Wolf. 2 ills., 1,400 words. Engineering and Cement World, April 1. 15 cts.

Bridge Patent Litigation in Iowa. History of concrete bridges and decision in the Luten Patent Case. 3,000 words. Engineering and Cement World, April 1. 15 cts.

Necessity for Engineering Supervision Over Bridge Maintenance. Discussion of the several features requiring supervision and reasons for deterioration. By G. P. Burch, Bridge Engr., Illinois Dept. of Public Works. 10 ills., 3,000 words. Engineering and Cement World, April 15. 15 cts.

Wooden Floors on Highway Bridges Are Now Obsolete. Modern motor-truck loadings overtax the stringers. Fire in floor planking likely to destroy the trusses. By J. A. L. Waddell. 1,200 words. Engineering News-Record, April 25. 20 cts.

Fire.

Fire Prevention Work in Canton. Abstract from report of Fire Chief R. O. Mesnar. 1,600 words. Fire and Water Engineering, April 13. 15 cts.

The Two-Platoon System. Recent action in regard to its adoption by Fire Depts. in many places in the U. S. 1,000 words. Fire and Water Engineering, April 17. 15 cts.

Arson Convictions in the State of Kansas. Work done by State Fire Marshal L. T. Hussey. 1,500 words. Fire and Water Engineering, April 24. 15 cts.

Firemens' Pensions. Jersey City said to have decreased from $100,000 to $32,000. 1,200 words. Fireman's Herald, April 6. 10 cts.

Government and Finance.

The Instability of Municipal Reform. Editorial comment upon the return of Philadelphia to the control of politicians. 700 words. Municipal Journal, April 27. 10 cts.

Municipal Finance. Its Relation to Pavement Construction and Renewals. Paper before American Soc. of Municipal Impvts. By Geo. C. Warren. 1,000 words. American City, April. 40 cts.

"Cost-Plus-a-Fee" Contract for Public Works Letting. Form of contract used at Kansas City, Mo. 1,000 words. Engineering and Contracting, April 24. 15 cts.

Rates for Public Utilities Service. Cost of service, origin of expenses, differential rates and other considerations entering into the problem. Paper before Illinois Gas Association by J. M. Spitzglass. 5,500 words. The Gas Age, April 1. 25 cts.

Motor Vehicles.

San Francisco's Municipal Bus Line. First municipal line, recently put into service. 1 ill., 200 words. Municipal Journal, April 27. 10 cts.

Seattle Keeps Accurate Records of Auto Trucks and Automobile Operations. Street and sewer department cuts operating costs in half in two years. Complete daily, monthly and yearly records for each car. Comparative results for cars summarized and posted. By C. A. Osier. 3 ills., 1,000 words. Engineering News-Record, April 4. 20 cts.

Return Loads Bureau. Spread of the idea throughout the eastern states. 700 words. Municipal Journal, April 20. 10 cts.

Street Railway Fares.

Increased Electric Railway Fares. Review of the movement to secure additional revenue throughout the United States. 6,000 words. Aera, February. 30 cts.

Progress of Fare Increase Movement. Narration of recent occurrences that mark effort to secure living wages for railways. 3,000 words. Aera, April. 30 cts.

The Trend of Regulation of Street Railways. Some decisions and opinions of courts and commissions. 2,000 words. Aera, April. 30 cts.

Relief for Public Utilities. Necessity in the interests of the National Government. By Thomas N. McCarter, President Public Service Corporation of New Jersey. 1,000 words. Aera, April. 30 cts.

Electric Lines and Traffic Congestion. Plans being worked out for further usefulness in relieving conditions—"skip" stop system finding increased favor—adoption of "staggered" hours as patriotic duty. 2,000 words. Aera, April. 30 cts.

Direct From Producer to Consumer Via Municipal Markets. Brief description of municipal marketing in New Jersey Cities. By A. L. Clark, Chief, Bur. of Markets, New Jersey State Dept. of Agriculture. 4 ills., 1,500 words. New Jersey Municipalities, April. 25 cts.

Underground Steam Mains. Describes the various types of conduits in common use. By Charles L. Hubbard. 2 ills., 2,400 words. Power, April 16. 10 cts.

Bonus for Laborers Increase Yardage and Lower Cost of Paving. In face of severe labor shortage, Flint, Mich., contractor speeds up work by paying premium to every man in gang. By Clarence E. Ridley. 800 words. Engineering News-Record, April 11. 20 cts.

Economic Consideration in Municipal Engineering Designs. Explanation of features entering into such designs. By Clinton S. Burns. 2,500 words. Engineering and Contracting, April 10. 15 cts.

Engineering Students and the War. Editorial advocating increasing the sizes of classes in technical schools. 650 words. Municipal Journal, April 27. 10 cts.

Public Works and the City Engineer. Report of Bur. of Municipal Research on the desirable coordination of the city engineer's department and the street department. 800 words. Municipal Journal, April 6. 10 cts.

Characteristics of Dynamite. Suggestions for keeping and using it. 1,200 words. Southern Good Roads, April. 15 cts.

Waterproofing Cement Pole Settings. Sealing top of concrete setting with tar. 1 ill., 700 words. Engineering and Cement World, April 1. 15 cts.

PERSONALS

Bowers, S. E., assistant city park engineer of Cleveland, O., has been appointed head of the new division of underground works of the city.

Hurtgen, P. J., who has been acting city engineer of Kenosha, Wis., has been elected city engineer for the coming year. Mr. Hurtgen has been dividing his services between Burlington, Wis., and Kenosha, but will give his entire time to Kenosha. Ben Brennan, former city engineer, is now with the United States Army in France, and his position is to be held open.

McFall, James, formerly chief of the Roanoke, Va., fire department, is now general fire marshal of the Emergency Fleet Corporation, U. S. Shipping Board, and is located at Washington at present. He is secretary of the International Association of Fire Engineers and is very well known by the chiefs of the country.

O'Neil, J. Denny, state highway commissioner of Pennsylvania, is a popular candidate for the Republican gubernatorial nomination. Mr. O'Neil is fifty-two years of age and has been a business man for thirty-two years, a department store merchant, a banker and a newspaper owner of McKeesport. He is a stockholder and director in several other business concerns in the western part of the state. He made a national reputation for himself as Insurance Commissioner of this state, having cleaned up the crooked companies in Pennsylvania. He has been active in public matters for twenty-eight years. He was recorder of

(*Continued on page 406.*)

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

May 13-17.—AMERICAN WATER WORKS ASSOCIATION. Annual convention, St. Louis, Mo. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

May 14.—AMERICAN ASSOCIATION OF ENGINEERS. Fourth annual convention, Chicago, Ill. Secretary, A. H. Krom, 29 South LaSalle St., Chicago.

May 15, 16.—SOUTH DAKOTA ELECTRIC POWER ASSOCIATION. Annual convention, Carpenter Hotel, Sioux Falls.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Goss, 315 Plymouth Court, Chicago, Ill.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, P. O. Box 1015, Washington, D. C.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

International Association of Fire Engineers.

The annual convention of the International Association of Fire Engineers will be held in Chicago June 4, 5 and 6, with headquarters at the Sherman House.

An exhibit hall has been secured for the display of small equipment. This room adjoins the convention hall in the Hotel Sherman. Applications for space should be made direct to Chief W. B. Cody, Atlanta, Ga., chairman.

The following subjects have been handed the secretary for discussion at the Round Table meeting on Wednesday night. Other subjects may be presented at the time of the meeting:

Fire Equipment and Protection of Our National Shipyards.

Exercise and Recreation, What Provisions Are Best?

How Can Inspection of Buildings Best Be Carried On in Two-platoon Departments?

Can Men in Off-shift in Two-platoon Departments Be Depended on for Serious Fires? If So, What Arrangements Are Best for Calling Them?

The Small Village Fire Department.

The Absolute Elimination of the Wooden Shingle by State or Municipal Legislation.

Cellar Drainage.

Use of Flying Squadron.

What Has Been Accomplished in the Past Five Years by Fire Prevention?

The Storage and Handling of Explosives.

The following topics will be discussed in the speeches:

"Automatic Sprinkler Alarm Service," John Kenlon, chief, New York, and F. A. Raymond, engineer, National Board Fire Underwriters, New York.

"The Relation of City with Industrial Plant Departments and the Best Method of Co-operation," Philip J. Harty, fire chief, Youngstown Sheet & Tube Co., Youngstown, Ohio; N. V. Holmes, fire marshal, Sears, Roebuck & Co., Chicago, and Thomas J. O'Connor, fire chief, General Electric Co., Schenectady, N. Y.

"Exposure Hazards," William H. Murphy, chief, Philadelphia, Pa.

"Four-wheel Motor Apparatus," William H. Daggett, chief, Springfield, Mass.

"Drill and Training, What Kind? How Frequently? And What Provision Necessary For?" Frank G. Reynolds, chief, Augusta, Ga., and R. F. McLaughlin, chief, Norfolk, Va.

"Feasibility of Gasoline Engine Driven Fire Boats," Charles Schnibbem, chief, Wilmington, N. C., and A. D. Stevens, marine engineer, Jacksonville, Fla.

"Fire Fighting in Vessels—Special Tools Needed," dep. chief Worth, New York, and district chief Shallow, Boston, Mass.

"The Proper Safeguarding and Prevention of Fires in Mills and Elevators," C. W. Ringer, chief, Minneapolis, Minn.

American Association of Engineers.

The Chicago chapter of the American Association of Engineers recently attempted to arouse local engineers to a greater sense of their civic duties and to get them to thinking on public questions. It sent its members a ballot on five subjects which were not discussed or qualified in any way. The chapter has about 650 members but only 110 voted. The results were as follows: For national prohibition, 88%; for national women's suffrage, 92%; for city manager plan for Chicago, 96%; for an engineer in city council, 99%; for engineer for smoke inspector, 100%.

Co-ordination of engineering society activities is to be the principal subject of discussion May 14 at the annual convention of the American Association of Engineers meeting jointly with the Committee on Engineering Co-operation. Delegates from 250 national, state and local societies have been asked to attend this forum, the main idea in mind being "What More Can Engineers Do to Win the War?"

To assist the delegates in their survey of society service all societies have been requested to submit answers to 24 questions on society activities, war programs, employment features, education and publicity.

The following speakers are on the program: Major Gardner S. Williams, E. T. Perkins, C. E. Drayer, Col. Charles S. Riche, Corps of Engineers, Alfred D. Flinn, secretary Engineering Council, and W. H. Finley, chief engineer, Chicago & North Western Railway.

Southwestern Water Works Association.

The recent convention of the Southwestern Water Works Association, held in Tulsa, Okla., April 23, 24, 25 and 26, was featured by a number of interesting and well-received papers.

Tuesday morning was taken up with the formal speeches, including the address of welcome by mayor J. H. Simmons of Tulsa and the president's address.

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PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

A SEWAGE DISPOSAL PLANT is to be built by Jewell, Ia., plans having been completed by Chas. H. Currie.

A SEWER SYSTEM is to be built by Parker, S. D. Plans and specifications for the work were prepared by the engineer, W. L. Bruce.

BRIDGE REPAIRS are to be made by Delaware county, Media, Pa. Plans for the work have been prepared by James B. Long.

A number of STREETS are to be improved by Blissfield, Mo. The engineers for the work are the firm of L. A. Boulay Company.

A comprehensive CITY PLAN, including a SEWER SYSTEM, etc., is being developed for St. Augustine, Fla., by the American Park Builders.

The Little River Drainage District, Cape Girardeau, Mo., is to construct a SPILLWAY, plans for which were prepared by the engineer, Isham Randolph.

A WATERWORKS SYSTEM is to be built by Bushnell, Neb. The system was designed by the engineer, R. D. Salisbury.

The town of San Pedro, Cal., is to build a SEWAGE DISPOSAL PLANT, plans for the work being in process of preparation by the engineer, A. C. Hansen.

WATERWORKS and SEWERAGE SYSTEMS are to be constructed at the new quartermaster's depot near Harrisburg, Pa. The firm of Gannett, Seelye & Fleming has been appointed in a consulting engineering capacity.

INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A, $1 extra.

Exhibits at Water Works Convention.—Burt H. Hodgman, chairman, exhibit committee, Water Work Manufacturers' Association, has issued a statement emphasizing the ruling of the committee that only fifty pounds of exhibits may be shown at the convention. This is exclusive ot photographs and pictures.

The Aspromet Company, Pittsburgh, Pa., announces the removal of its New York office to 170 Broadway.

The United Brass Mfg. Co., Cleveland, O., announces that R. F. Valentine has been appointed sales manager. Mr. Valentine was formerly connected with the Mechanical Rubber Co., the Sawyer Belt Co. and the Boston Woven Hose and Rubber Co. He takes the place of Sam P. Schoenberger, who has resigned.

The National Gas Engine Association is to hold its eleventh annual meeting at the Sherman Hotel, Chicago, June 3-4. The subjects to be discussed on Monday are as follows: "The Iron and Steel Situation"; "Government Requirements on Gas Engines and the Method of Handling Those Matters at Washington"; "The Labor Situation"; "The Fuel Problem," which will be handled by a representative of the Federal Fuel Administration. On Tuesday forenoon the following paper will be read: "What Is the Future of the Farm Gas-Engine Business"; "Sizes of Manufacture from the Manufacturing and Sales Standpoint"; "The Present Condition and Future of the Gas-Engine Export Trade." On Tuesday afternoon there will be a technical session in connection with the Mid-West Section of the Society of Automotive Engineers, at which a number of papers of a technical nature will be presented and discussed.

The American-La France Fire Engine Co., Elmira, N. Y., recently made the following shipments: Highland Park, Mich., type 17 6-cylinder 75-feet aerial truck; Seattle, Wash., type 14 combination service truck, type 30 triple combination; Somerset, Mass., type 40 combination; Wheeling, W. Va., type 45 triple combination chemical engine and hose car, type 12 combination; Boise, Idaho, type 31 steamer tractor; Louisville, Ky., type 10 combination chemical engine and hose car; Ferry, Ohio, type 31 aerial truck; Seattle, Wash., two type 12 combinations; Watervliet, N. Y., type 12 triple; Charleston, W. Va., type 12 triple; Peekskill, N. Y., type 12 combination chemical engine and hose car; Pottstown, Pa., type 17 tractor; Cherokee, Iowa, type 40 combination chemical engine and hose car; Beverly, Mass., type 12 triple combination; Pulaski, N. Y., Brockway type B combination chemical engine and hose car; St. Louis, Mo., type 45 combination chemical engine and hose car; Sioux Falls, S. D., type 31 85-feet aerial truck; Norristown, Pa., type 12 combination chemical engine and hose car; Jersey City, N. J., type 31 75-feet aerial truck; Newark, N. J., two type 45 triple combination chemical engine and hose car.

PERSONALS

(*Continued from page 404.*)

deeds in Allegheny County and placed a new system in operation. He was commissioner of Allegheny County for seven years and had charge of the road building. During his term over 300 miles of new roads were built and all important toll bridges in the county were made free. During the time he has been highway commissioner he has succeeded in creating a good feeling between the various counties of the state and the highway department, has secured an agreement with the majority of the counties whereby they pay half the cost of roads built in their counties. He is gradually freeing the toll roads of Pennsylvania. He accomplished a difficult task in the winter of 1917-1918, the most severe in the memory of many, when, through a concentration of his highway forces, he kept the roads across Pennsylvania from Ohio to the seaboard open all the time for the transportation of army trucks and supplies. He favors equal suffrage. He is state chairman of the Local Option Committee of Pennsylvania. He is a Trustee of the Anti-Saloon League of Pensylvania and he is also a director of the Dry Federation of the state. The good roads plank in his platform says, in part:

> "To keep the people on the farms give them good roads to get to the markets, and the same to the people who are employed in the cities and live in the country. The present road laws were passed by the politicians and for the politicians and they have always refused to appropriate sufficient money for maintenance and construction. The revenues of this great state are sufficient to construct a comprehensive system of roads if the business of the state is conducted along economic lines. I am in favor of an act which will give the boroughs and townships more aid in the construction of local roads. I have already inaugurated a plan whereby the state pays 50 per cent of the cost of any state highway passing through a borough. This plan is working successfully. The supervisors of the various townships of the state have 80,000 miles of roads to maintain while the state has only 10,300. Therefore, I favor a plan whereby the state can make appropriations to townships for the construction and maintenance of their roads, with local help and local material. When the conditions permit I favor the construction of an improved road on one side for automobile and heavy truck traffic and the maintenance of a dirt road on the other side for teams and horses. I favor the state taking over all bridges on state highways and the erection and maintenance by the state of such bridges in the future. I am opposed to the earth roads of the state being turned back on the counties."

NEWS OF THE SOCIETIES

(*Continued from page 405.*)

In the afternoon the following papers were presented: "Operating Difficulties in Mechanical Filter Plants," C. Arthur Brown, Chicago, Ill.; "Water and Sewage Sterilization," C. A. Jennings, New York; and "Cement for Cast Iron Water Pipe Joints," Henry E. Elrod, Dallas, Tex. The session was followed by an auto ride over the city.

On Wednesday morning the members heard the following papers: "History Outline of the City Waterworks of Tulsa," E. M. Stevens, city engineer; "After the War Prices on Waterworks Materials," R. F. McDonnell, and "Pumping by Electricity," M. L. Whitney, Dallas, Tex. These papers were followed by the Question Box.

The afternoon was pleasantly occupied by an exhibition of Tulsa's new pumping engines at Owens Park Lake and an auto trip to the city filtration plant, where there was presented a demonstration of a 20-inch valve insertion under pressure, by a representative of the A. P. Smith Mfg. Co., East Orange, N. J. A theater party was enjoyed in the evening.

Thursday morning was devoted to the following papers: "Cleaning of Water Mains, Methods and Results," Burt B. Hodgmen, New York; "Engineering and Chemicals," H. H. Howard, Dallas, Tex., and "Rules and Regulations Covering Municipal Water Plants," T. O. Cheatham, Waxahachie, Tex. These were followed by an address on "Improvement in Water Mains," by M. Griffin O'Neil, representative of the Central Foundry Company of New York. A trip to Sand Springs Orphan Home and Hospital, an informal dance, general sports, a ball game between superintendents and supply men occupied the afternoon, and a banquet was held in the evening.

Friday was taken up with the election of officers and unfinished business.

Health Insurance Conference.

Health and old age insurance commissions of seven other states besides Ohio have been invited to Cleveland for a conference on May 13 and 14.

The meeting is for the purpose of mutual cooperation between the commissions who are studying health insurance and old age pensions.

The states to be represented besides Ohio are California, Wisconsin, Illinois, Pennsylvania, New Jersey, Massachusetts and Connecticut.

Royal Meeker, United States Commissioner of Labor Statistics, will be present to offer the various commissions the help of the federal government. Mr. Meeker is already gathering a large amount of data for the Ohio commission and this will be made available for the other states.

The special topic to be presented is methods of investigation. This subject will be discussed by John A. Lapp, the Ohio director.

Municipal Journal

Volume XLIV. NEW YORK, MAY 18, 1918 No. 20

SEWAGE TREATMENT AT COLUMBUS

First Year's Operation of the Two-Story Settling Tanks That Replaced the Original Septic Tanks—Odor and Sludge Give Less Trouble—Insufficient Capacity of Sprinkling Filters Causes Unsatisfactory Effluent.

The sewage treatment plant at Columbus, Ohio, has, during the past two years, been undergoing considerable changes which have interfered with its regular effective operation, and it seems probable from the experiences of 1917 that further changes or extensions are desirable, if not necessary. During part of 1915 and 1916, septic tanks that formed part of the original construction were changed into two-story tanks of the Imhoff type and part of the new tanks were used in 1916, but the entire installment of two-story tanks was not ready for service until 1917. The result of the first year's operation of these tanks was of considerable interest, one feature of which is the comparison which it permits between results obtained by septic and Imhoff tanks.

As in previous years, the plant was not operated during the entire year, but only during the months of May to November, inclusive. At other periods of the year, and during high water, the sewage is discharged directly into the river without treatment. The total amount treated during 1917 was 4,082,000,000 gallons, the mean daily amount being 20,830,000 gallons. This was derived from a population estimated at 220,000. The sewage is lifted at a main pumping station through 6,336 feet by a 48-inch force main to the sewage treatment works; 2,330 feet of 48-inch force main serving to carry the discharge directly to the river during high water. The pumps discharge against a head of about 24 feet. The maximum rate at which they operated during the year was 32,000,000 gallons per day, but the maximum pumpage in any one day was 26,840,000.

Before passing into the pumps, the sewage is screened. During the year the screens were cleaned 1,096 times and 2,222 wheelbarrow loads of screenings were removed. Provision was made for removing sand and refuse, and 3,330 wheelbarrow loads of this were removed. This large amount of heavy material is due to the fact that the sewers are on the combined system. The sewage is measured at the pumping station by means of a Venturi meter 48 inches by 20 inches, provided with indicator, recorder and register. The main pumping plant was in service about 197 days, or 54 per cent of the time. The total annual operating cost of the pumping station was $18,410, or $4.48 per million gallons pumped.

On reaching the treatment plant the raw sewage passes through the settling tanks and the effluent is oxidized by spraying it onto sprinkling filters. The effluent from these is passed through a shallow sedimentation basin for the purpose of removing the matter which leaves the sprinkling filters occasionally as they purge themselves. From these the effluent passes to the Scioto river. The sludge from the settling tanks is drawn off upon sludge beds from which, after drying to a consistency that will permit of its being shoveled into cars, it is hauled to a dump site. The solids deposited in the shallow sedimentation basin also are pumped to a disposal site.

The flow in the Scioto river varies from a minimum of about 5,000,000 gallons per day to an average yearly flood flow of 22,000,000,000 gallons per day and a maximum flood flow of 77,000,000,000 gallons per day. The average daily discharge from the sewage treatment plant is about 20,000,000 gallons. It is seen, therefore, that during the minimum flow of the river this is only one-fourth as great in volume as the sewage effluent; but that during average flood flow the river flow is about 1,000 times as great as the sewage effluent. The temperature of the river is a very important factor in determining whether or not the combined treatment and dilution are sufficient to prevent objectional pollution of the stream. When the quantity is small and the temperature is high, conditions are at their worst; but during times of flood the dilution is ample to prevent any nuisance whatever.

During last year the average amount of settleable solids, based on daily composite samples, was 3.28 C. C. per liter, or 438 cubic feet per million gallons. The total suspended solids in the crude sewage averaged 231 parts per million, 56 per cent of the total suspended solids being settleable. The proportion of settleable to total suspended solids in Columbus sewage is believed to be unusually low and subsidence of the solids is unfavorably affected by long travel in the sewers and by the action of the centrifugal pumps that force it to the plant. The settling tanks removed 86 per cent by volume of the settleable solids, but only 55 per cent by weight of the total suspended solids.

The odor from the effluent from the two-story tank last year was not nearly as offensive as had been that from the septic tanks which they replaced, and in this respect the chemist in charge, C. B. Hoover, states that the experience was quite gratifying. During a part of the year there was some trouble with foaming, which had given a great deal of trouble when the first tanks were operated at an undesirably high rate, in 1916. This foaming causes the tanks to present a wretched appearance and also increases the odor. With adequate sludge disposal apparatus, however, it is believed that the foaming can be properly controlled.

Sludge drawn from the tanks after six weeks' storage was not particularly offensive. Four feet of hydrostatic head was available for removing the sludge, but this was assisted to a greater or less extent by water discharged from a movable submerged pipe. It was found that sludge with 85 per cent moisture would not flow readily in the channels nor distribute properly over the long, flat sludge beds, but when the percentage of moisture was increased to 90 per cent the sludge would flow and distribute satisfactorily.

Experience with running the sludge onto the beds to different depths demonstrated that if the depth was 12 to 15 inches the sludge dried very slowly, but when it was reduced to between 6 and 8 inches the drying period was very materially shortened. As the sludge dried, shrinkage cracks opened up, and the material was found to be quite porous so that it drained out readily. The dried sludge has very little odor. It is hauled in cars and dumped on low land, but utilization of it as a marketable fertilizer was being investigated a few weeks ago with the co-operation of the garbage reduction works which are nearby.

The labor required to remove the sludge was 0.839 hours per cubic yard and cost 27.8 cents; in addition to which there was a cost per cubic yard for removing of 1.6 cents for gasoline and 0.1 cent for other expenses, giving total cost of sludge removed at 29.5 cents per cubic yard. During the year 2,163.66 cubic yards were removed and carried an approximate length of haul of 750 feet. This total amount of sludge was derived from 4,082,000,000 gallons.

Although the sprinkling filters were operated during 1917 with about the same dose per day as in 1916 (2.42 million gallons per acre per day for 1917, as compared with 2.34 million in 1916), and although the effluent was of lower concentration last year, the nitrification effect was considerably inferior in 1917, and consequently the quality of the effluent. There was an unusual amount of pooling and storage of suspended matter. Also there were scarcely any moth flies as compared to previous years. During 1917 there were 8.61 acres of sprinkling filters in service as compared to 8.29 in 1916, and the mean rate was 3.41 million gallons per acre per day as compared to 4.33 the previous year, and 3.64 during 1915. The average time in service was 17.01 hours, which is the highest since the sprinkling filters were put into service in 1910, the next highest being 14.36 hours in 1915. The filters removed 31 per cent of the total suspended solids contained in the effluent, and the whole plant removed 71 per cent of the suspended solids. The filters effected 65 per cent reduction in the amount of dissolved oxygen consumed in 24 hours at 37 degress C.; the reduction in this effected by the entire plant being 73 per cent. The stability value of the final effluent during 1917 was 31 per cent, having been 33 during 1916, 79 during 1914 and 84 during 1912.

The amount of total suspended matter in the effluent gradually increased from 42 parts per million in May to 114 in November, and the dissolved oxygen consumed increased from 33 parts in May to 64 parts in November, passing through a minimum of 24 parts in July. The stability value reached a maximum of 55 in July, dropping to 22 in August and 12 in October, rising gradually to 18 in November.

Examinations were made of the effluent of the river above the treatment plant outlet and at points 7, 11 and 16.3 miles below such outlet. The pollution of the river before reaching the treatment plant is indicated by the fact that the dissolved oxygen consumed averaged 4.3 parts per million just above the city, and, although increased to 6.9 in passing this plant and the city, fell to 2.5 parts 16.3 miles below. Commenting upon the result of these examinations, Mr. Hoover reports that they apparently warrant three conclusions: "(1) The degree of purification is insufficient to prevent exhaustion of oxygen in the stream during extreme low water stages and with a high river water temperature prevailing. The dilution in the stream at such times is often as low as one volume of river water to four volumes of treated sewage. (2) The degree of purification is sufficient to prevent exhaustion of oxygen in the stream during low water stages with low river water temperatures prevailing; also during normal river stages with high river water temperatures prevailing. (3) There is entirely too much pollution of the stream above the treatment works. This pollution should be stopped, and we recommend that this be brought to the attention of the proper city, township or county officials."

He believes that the insufficiency of treatment referred to in the first conclusion is due to overloading the sprinkling filters. During the first five years these filters were operated with a mean dose of 1.52 million gallons per acre per day, while the mean dose last year was 2.42 million gallons, or more than 50 per cent greater. Assuming 100 gallons of sewage per capita per day, this gives 24,200 population per acre of 5½-foot bed. During the first five years, the dissolved oxygen consumed by the effluent was 25 parts per million, while during 1917 it was 43 parts; and the average stability value of the effluent during the first five years was 76 per cent, while it was only 31 per cent last year. The amount of sewage treated daily has increased from a mean of 11.4 million gallons in 1910 to 20.8 in 1917.

It certainly would seem to be almost imperative that the plant be further extended and improved, since in September, for example, with the river at its lowest stage, the stability value of the effluent was but 13, and the river 7 miles below the plant contained no dissolved oxygen, consumed 11.5 parts of dissolved oxygen, and had a stability value of only 3, which had increased to 43 four miles further on. The condition of a river which, seven miles below the treatment works, has a stability value of only 3 and contains no dissolved oxygen, would certainly seem to call for some action by the State Board of Health; and it would appear that a considerable extension of the sprinkling filter area is necessary. What would be the result if the filters had to be operated continuously is indicated by the steadily decreasing effectiveness of the plant during the seven months that it is operated.

The cost of operation per million gallons treated has decreased from $3.91 in 1911 to $1.84 in 1917. Since the cost per million gallons last year was very much less than during the first five years of operation and was less than 4 cents per capita, there seems to be no possibility of advancing the argument that the city cannot afford to spend more money on the sewage treatment plant. It would appear from the figures that an issue of bonds sufficiently large to make the necessary extension could be carried without increasing the cost per million gallons to a figure much, if any, higher than the cost during the first few years of operation.

GRANITE BLOCK PAVEMENT IN WORCESTER.

Granite block pavements are laid in Worcester, Mass., with longitudinal expansion joints. The reason for this, as explained to the American Road Builders' Association by A. P. Rhodes, is because the vibration of traffic is transmitted too greatly through the curb and sidewalk to the abutting buildings unless this is done. Except for these joints, the pavements are filled with cement grout.

The grout for filler may be too thick for successful application. It should be of the consistency of rich cream, but thin enough to run in easily. The grout can be run to the bottom of the joints by wetting the peastone used and throwing the stone into the grout as it is dumped on the street, instead of putting the stone in the joints first. A twin grout mixer is used, and with an improvement devised on the work, the capacity is doubled, the machine being able to grout behind two gangs of block layers and also to grout the concrete base ahead. Any surplus grout should be removed from the top of the pavement after it is completed.

Mr. Rhodes does not recut old granite blocks, but culls out the poor blocks for use in paved gutters on other classes of streets. Using the better blocks with grout filler, he thinks he gets streets as good as new, and he is not satisfied that the shallow recut blocks give a pavement sufficiently strong.

He has had some unfortunate experiences with heavy loads on steel-tired trucks and trailers running at speeds more than four miles an hour, which have very seriously worn granite block pavements in a short time. The granite blocks should not be too hard; if they are not, they will wear smoother than hard ones and at the same rate as the filler and the individual blocks will not lose their edges and produce a cobblestone effect.

Worcester pavements are cleaned by flushing, using two flushing trucks and also flushers mounted on electric trolley cars. They do not injure the pavements, even those with sand filler.

STREET SIGNS AT CAMP CUSTER.

By CHESTER W. SHAFER.[*]

Army officials at Camp Custer, the national army cantonment near Battle Creek, Michigan, have made that new "municipality" understandable to the public and have adopted a system for public information which makes it possible for any one to find his way about this city of 7,200 acres. By the simple but liberal use of signs, visitors at the camp are able to proceed directly to their destination and a stranger can find his way to any part of the camp without the least confusion. The officials believe, in fact, that the system could be adopted with profit in many of the difficult civil communities of the country.

The camp is built on both sides of a concrete highway which runs through the entire camp from the east to the west. Signboards denote the avenues paralleling the highway and the streets that intersect it. With these signs alone the work of locating a barrack is not difficult. But to make it more simple, every branch of the service, the infantry, artillery, ambulance and others, is pointed out by huge signs placed on poles along the highway. All buildings of importance also are pointed out by means of signs.

Before this system was put into operation, visitors at the camp, arriving by the thousands on Sundays and holidays, spent most of their time asking the military police and officers where to find their soldiers. But with this system the work of locating a relative or friend is greatly simplified.

All motor traffic over the six-mile concrete road that connects the camp with Battle Creek, and also over the highway through the camp, is directed by a series of signs. The white commands govern all driving and regulate it so that there are few accidents. No horse-drawn vehicles are allowed on the highway. Whenever a stop is made, the driver is required to draw up on the shoulder of the road. In the eight months that the camp has been operated there have been no collisions.

VALUE OF SEWERAGE SYSTEMS.

In the annual report of the New York State Board of Health, recently published, there appears an excellent presentation of the economical and sanitary value of sewerage systems, that we reprint below complete.

Of the 305 villages in this state that were incorporated before 1890 and of which complete population records are available, 32 per cent are provided with public sewerage systems. As may be expected, a greater per-

GUIDE BOARDS IN AND AROUND CAMP CUSTER.

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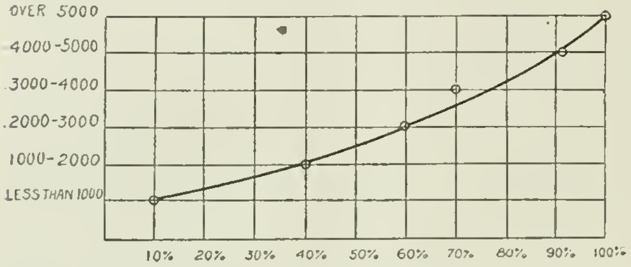
[*] Mr. Shafer, who has contributed several articles to Municipal Journal, is a member of the 310th Sanitary Train at Camp Custer.

centage of the larger municipalities are provided with sewers than of the smaller communities. Eight and one-half per cent of the villages having a population of less than 1,000 in 1890 are now provided with sewers; 38.8 per cent of the villages having populations of from 1,000 to 2,000 have sewers; 61 per cent of the villages between 2,000 and 3,000; 71 per cent of those between 3,000 and 4,000; 93 per cent of those between 4,000 and 5,000; 100 per cent of the villages having a population of more than 5,000 in 1890 are provided with sewers. The following curve shows graphically the relatively uniform rate of increase in the number of villages provided with sewers with the increased size of the villages.



CURVE SHOWING RELATIVE RATE OF INCREASE IN NUMBER OF VILLAGES PROVIDED WITH SEWERS WITH THE INCREASE IN THE SIZE OF THE VILLAGES.

Although the growth of a community does not necessarily depend upon its having a sewerage system, it is significant that the increase in population from 1890 to 1915 in New York state of those villages now provided with sewers was 43 per cent, while the increase in population of villages not provided with sewers was only 9 per cent for the same period. If the villages which have become cities since 1890, all of which are provided with sewers, were considered, the contrast would be even more marked. Many of the villages provided with sewers have increased in population from 100 per cent to 1,100 per cent in 25 years, while in only two villages not provided with sewers has the increase in population exceeded 100 per cent. It may also be noted that although 33 per cent of the villages without sewers have decreased in population since 1890, only 12 per cent of the villages provided with sewers have shown a decrease in population between 1890 and 1915. There can be no question therefore but that a sewerage system has considerable commercial as well as sanitary value.

SEWER PIPE JOINTS

Experiences of a Number of Engineers in Securing Tight Joints—Use of Cement in Various Ways, Sulphur-Sand, and Bituminous Compounds.

A few weeks ago the subject of sewer pipe joints was discussed at a meeting of the Boston Society of Civil Engineers, by seven of the members, and many interesting experiences and details of practice were brought out. The necessity for tight joints in separate sewer systems, both to prevent the seepage of ground water and the entrance of tree roots, was recognized, and most of those entering into the discussion had endeavored to secure such joints by the use of materials other than cement mortar. However, L. W. Hastings, city engineer of Cambridge, believed that the "cement joint is likely to give as good results as any. I believe, however, that the poured grout is the best way in which to use it and get a full joint. Various devices have been suggested for holding the cement grout in place when poured. A very simple and inexpensive one is a sort of band or collar made of paper fabric about 2½ inches wide, one edge of which is attached to the bell of one pipe and the other edge is attached to the body of the next pipe, by cords passing around the pipe and firmly binding the collar to it. The grout is then poured into the joint space through a hole in the collar until it is entirely full. The collar can be left in place, as the cost of it is very small."

George A. Carpenter, city engineer of Pawtucket, R. I., has reported having used nothing but the old-fashioned mortar joint, with the more or less recent improvement of using a strip of cheese-cloth to hold the mortar in place.

Variations in the use of Portland cement were described in several of the discussions. Mr. Varney said that he had tried constructing wooden boxes to fit the lower half of the pipe and long enough to extend each side of the bell, which were set to proper grade and then filled with rich mortar so that there could be no question that each joint was thoroughly bedded and protected. In another instance, he encased the entire pipe in 6 inches of concrete; but in each of these cases there was still considerable leakage. Mr. Brewer found the use of the jute gasket more of a nuisance than a help, because in a great many places it was not properly calked into place and after the contract was completed there was hardly a section of sewer which did not show on examination either a string or loop of jute protruding into it. He believed that when used with a large follower, large enough to fully clean the inside of the pipe, the gasket is not necessary and is not as permanent as the cement, and he has abandoned its use. He found that rich mortar joints, one cement to one sand, uniformly pressed into the space between bell and socket and wound with cloth would keep out tree roots. "It accommodates itself to the slight movement which every pipe experiences before backfilling is completed. Moreover, if given a chance to set up without being seriously disturbed, such a joint is nearly watertight. The discovery of the use of the cloth wrapping is one of the greatest improvements in sewer jointing yet introduced. It gives the skilled pipe layer an excellent opportunity to pull and push and smooth the mortar into place and protects the mortar during backfilling. (This method of using cloth was described in "Sewerage" eighteen years ago, and had been used by the author for some years previous.) Mr. Marston also referred to the use of the cloth wrapping by Metcalf & Eddy but stated that, although the use of such wrapping was of value in preventing the bottom of the joint from falling off, it has been found difficult in contract work to get sufficiently watertight joints with Portland cement. He described at some length the Weston sheet metal form and gasket for pouring cement grout joints. (This was described in Municipal Journal for April 12th, 1917.)

Of the other materials used, the earliest referred to was a mixture of sulphur and sand. The method of using this was described most fully, and its use was apparently found most satisfactory, by Edwin H. Rogers, city engineer of Newton, Mass., whose description was as follows:

> The city of Newton, Mass., has a separate sewerage system, and for the past eleven and one-half years a sulphur and sand compound has been used exclusively as a jointing material for its vitrified pipe separate sewers and house connections, and for a limited amount of storm sewers.
>
> From June, 1906, to January, 1918, 28½ miles of vitrified pipe sewers and 31½ miles of vitrified pipe house connections have been laid with this compound of sulphur and sand. The size of the pipe sewers so jointed varies from 8 ins. to 20 ins., but 89 per cent of these sewers are 8-in. laterals. The house connections are 5 ins., with a few cases of 6 ins.
>
> The method of making the joints in the pipes is similar to the pouring of lead joints in water mains. After fitting any two pipes closely together, the joint is calked with

jute oakum, usually about ½ in. to 1 in. in depth, but only sufficient to prevent the jointing material from running into the interior of the pipe. A pipe jointer is then placed around the outside of the spigot end of one pipe, close against the bell of the adjacent pipe, leaving a triangular opening on top of the pipe through which the joint is poured full with the molten mixture of sulphur and sand. A ladle large enough to hold sufficient material to pour the joint completely full at one operation should be used, and sufficient time given for the sulphur and sand compound to harden before removing the pipe jointer. After removing the jointer, the exposed surface of the sulphur and sand mixture is painted with hot roofing pitch to close up any possible voids or slight temperature cracks. It may be questioned if this practice is an absolute necessity, but the cost per joint is but slight, only about half a cent per joint, and is an added precaution for watertightness. The Tee branches provided for future house connections are closed with a stopper held in place by roofing pitch, so as to be readily removed when necessary to make a connection with a house connection.

The sulphur and sand are mixed in equal parts by measure and melted together in an iron pot held in an iron frame and suspended over a fire of waste wood. Gasoline furnaces were previously used, but owing to the increased cost of gasoline the mixture is now heated by waste wood, which is almost always to be found on a piece of sewer work. When gasoline was used for fuel for melting, it required about .07 of a gallon of gasoline per joint.

The correct temperature to which the compound should be heated for use averages 260 degrees F. The use of a thermometer is unnecessary after the workmen become accustomed to handling the mixture, as the correct temperature is easily ascertained by inspection. If it is too cold, it will not flow properly, and if too hot the tendency is to foam in the kettle. The use of the compound does not involve any waste material, for that which is left unused in the kettle is melted the next time it is wanted and fresh material added, together with any fragments left from defective joints from leakage around the jointer in pouring the joints.

The sulphur is powdered sulphur of commercial quality, bought by the barrel. The sand is a very fine quicksand, which is obtained from a pit on the city of Newton waterworks reservation in the town of Needham. A great deal of the success of this type of joint depends on the fineness of the sand. Tests of the sand in use indicate that 90 per cent will pass a sieve having 100 meshes per linear inch and 50 per cent will pass a sieve having 200 meshes per linear inch. The pitch is ordinary roofing pitch. The jute is the usual type of tarred jute oakum. The pipe used is invariably deep and wide socket, as the annular space between the bell and spigot in standard pipe is considered too narrow for the best work.

The cost of sulphur varies from 2½ cents per pound in 1907 to 3 cents per pound in 1910, and 4.35 cents per pound in 1917. The sand is charged to each piece of work at the rate of $1 per barrel of 250 pounds or 0.4 cent per pound. The cost of the jute varies from 5½ cents per pound in 1918 to 8½ cents and 10 cents per pound in 1917. The cost of the pitch varies from 1 cent per pound in 1908 to 1.3 cent per pound in 1917.

The quantities of material per joint required for 8-in. pipe are about as follows: sulphur, 1½ lbs.; sand, 1½ lbs.; jute, ½ lb.; pitch, 0.4 lb. For 5-in. pipe the quantity of sulphur is about nine-tenths pound, and other materials in proportion. On the basis of present-day prices, the cost of materials for an 8-in. joint would be from 11 cents to 12 cents, but until recently the cost has been considerably less.

In 1907 a careful comparison was made of the cost of laying an 8-inch. pipe sewer of 38 cement joints with an 8-in. sewer having 31 sulphur and sand joints. This test, which included the labor and materials for laying the pipe in both instances, showed a cost of 26.5 cents per joint and 23.8 cents respectively, or that the sulphur and sand joint cost 90 per cent of the cement joint.

The advantages of the sulphur and sand joint appear to be many, and the following may be taken as the principal reasons for its use. When properly made, it is practically proof against leakage or infiltration and is entirely resistant to tree roots, while at the same time it is not complicated and is readily executed. There appears to be no material difference between the cost of sulphur and sand joints and cement joints, and whatever difference there may be is a small percentage of the cost of the sewers. In laying pipe up to 8 in. in diameter inclusive, three lengths of 3-ft. pipe can usually be jointed on the bank, where a perfect joint can be made with great ease and then lowered into the trench, and in the case of 10-in. or 12-in. pipe, two 3-ft. lengths can be so joined; whereas with cement joints the practice is to make every joint in the ditch. In other words, with the sulphur and sand joints in the smaller sizes of pipe, only 33 per cent, and in the medium sizes 50 per cent, are difficult of inspection, as against 100 per cent with cement joints. It requires excellent workmanship and vigilant inspection to make sure that cement joints are properly made, particularly at the invert of the pipe; whereas the sulphur compound tends to run around the bottom of the pipe and make the joint most secure at this point. No difficuly is experienced in cold weather by the use of the compound. In extreme weather and when the pipe is cold, it is easily heated by putting a string of tarred jute around the pipe at the joint and setting it on fire, thus heating the pipe sufficiently so that there is no difficulty in running the joint. After the joint is made, freezing weather will not hurt the sulphur compound, whereas cement joints should be protected from frost until the mortar is set. The time of setting of the sulphur compound is inconsiderable, for it is hard as soon as it is reasonably cool, whereas cement joints require a considerable period to harden.

Sulphur and sand joints are not flexible, but this is true of cement joints; and where there is a good foundation, nonflexibility in the sewer is no detriment in its construction. The sewer is usually placed at the lowest level of any of the structures in a street, and when it is laid in any material that provides a good foundation and is not susceptible to settlement, there appears to be no disadvantages in a rigid joint, and in fact the rigid joint will frequently assist in maintaining the grade and alignment of the sewer.

The soil in Newton through which the sewers are laid is mostly hard pan, gravel, sand or ledge, there being but little subsoil of peat or of filling. The sewers are under constant inspection, and breakages are of very infrequent occurrence, there having been but two or three breaks in the 60 miles of pipe jointed with the sulphur compound since its use was adopted from settlement of the foundation of a sewer or house connection.

Trouble is frequently encountered from tree roots on nearly all of our sewers which are laid with cement joints in which there are trees along the side of the street, and the same is true of the older house connections laid with cement joints with trees in the near proximity. We have had absolutely no trouble from the growth of tree roots in sewers or house connections laid with sulphur and sand joints.

The sewage in Newton is largely from dwelling-houses, but no difficulty has been experienced with deterioration of joints from sewage from any of the comparatively few mills or factories, the sulphur and sand compound being affected only by chemicals which are most rarely found in the trade wastes from manufacturing establishments and not at all in dwelling house sewers.

(To be continued.)

WATER WORKS OPERATION—DISTRIBUTION SYSTEM.

Data Concerning Services That Should Be Recorded—Securing and Recording Data—Office Records and Field Books—Scales of Maps and Records.

RECORDS OF SERVICES.

In many of the older cities, records of corporation cocks and house connections have not always been kept with sufficient completeness and detail, and a number are not supplied with curb cocks and boxes. The result is that in some of these cities there is believed to be a considerable amount of loss of water through abandoned services whose exact location is not known; and to dig up an entire street to find one or two possible leaking services is not to be considered, even though the aggregate loss of water from hundreds of such services is very large. And to think that five minutes taking measurements and notes of each service when it was made would have avoided all this trouble!

No part of an underground system should be covered up before it is so definitely located that it can be found without trouble at any future time. In the case of a service, the exact location of the corporation cock should be measured from permanent objects. Probably the

CLEANING MAINS, LEAKAGE AND METERS (Continued).

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
Iowa:						
Boone	Yes	Flushing	Sounder	No	100	City
Burlington	No	....	Surface indications, inspect sewers	No	4	Company
Cedar Falls	No	....	Inspection	....	80	City
Cedar Rapids	No	....	None	No	100	City
Creston	....	None	Inspection	....	95	....
Ft. Madison	No	....	None	No	30	Company
Hawarden	....	....	Leak detector	No	100	Both
Maquoketa	No	....	Leak detectors and flow in sewers	No	100	City
Sioux City	No	....	....	No	100	City
Spencer	No	....	None	No	50	City
Stanton	No	....	....	No	100	Consumer
Vinton	Yes	Flushing	Meters	No	100	Consumer
Washington	....	Flushing	None	....	....	....
Winterset	No	....	....	No	100	Consumer
Kansas:						
Chanute	....	....	None	....	100	City
Coffeyville	No	....	Observation	No	95	City
Council Grove	Yes	Flushing	None	Think not	80	Consumer
Emporia	Yes	Flushing	Inspection and microphone	Think not	100	City
Fredonia	No	....	Inspection and meters	No	80	City
Great Bend	No	....	None	No	100	Company
Hiawatha	No	....	None	No	100	Consumer
Horton	Yes	Flushing	None	No	100	City
Independence	....	None	Inspection and aquaphone	No	65	City
Larned	No	....	None	No	99	City
Manhattan	Yes	None yet	Meters	No	100	City
McPherson	No	....	Repair when found	No	99	City
Neodesha	....	....	None	No	100	City
Newton	No	Flushing	Sounders	No	95	City[g]
Osage City	No	Flushing	....	No	100	Consumer
Osawatomie	No	....	None	No	90	Consumer
Topeka	....	None yet	None	No	100	Consumer
Wellington	No	....	Meters	Yes	95	Both
Kentucky:						
Hopkinsville	No	....	Listening at hydrants	No	55	Company
Lexington	No	....	....	No	100	Company
Louisville	Not now	Pipe cleaning mach.	None	No	8	Company
Paris	....	Flushing	Testing services	....	10	Company
Richmond	....	Flushing	Inspection	No	15	Company
Shelbyville	No	Flushing	Inspection	No	100	Company
Louisiana:						
Kentwood	Not yet	....	Inspection	Yes	None	....
Ruston	....	....	Meters	No	90	City
Maine:						
Augusta	No	....	....	No	15	City
Calais	No	....	Alertness	No	Few	Company[g]
Farmington	No	....	....	No	0.4	Company
Fort Kent	Not yet	....	None	No	None	....
Norway	Yes	Flushing	None	No	One	Company
Van Buren	No	Flushing	....	No	None	....
Sanford	....	....	Pitometer	No	97	Company
Maryland:						
Baltimore	No	....	House inspection & pitometer	....	4	City
Massachusetts:						
Adams	Yes	Flushing	....	No	....	City
Athol	....	Flushing	....	....	5	City
Barre	....	....	....	No	16	Both
Belmont	....	Flushing	Meters on by-pass	No	100	City
Cambridge	....	By contract	House inspection	No	35	City[b]
Cherry Valley	No	....	....	No	50	City
Danvers	No	....	....	No	Factories	City
Falmouth	....	Flushing	Inspection	No	Few	City
Fitchburg	Yes	Flushing	Inspection	No	99	City
Framingham	Yes	Flushing	Meters	No	100	City
Franklin	No	....	Leak location; gen'l inspection	No	100	City
Haverhill	Yes	Replace them	Test in sections	No	36.2	City
Lenox	No	Flushing	Venturi meter	No	94	Company
Mansfield	....	....	....	No	60	Both
Medway	No	Flushing	None	No	50	City
Millbury	No	....	Inspection	No	70	Both
Monson	....	Never cleaned	None	No	50	City
No. Adams	Yes	Flushing	Pitometer in 1915	Yes	20[1]	City
Northampton	Yes	Flushing	House inspection	No	3.3	City
Orange	No	Flushing	....	No	100	Consumer

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*The word "city" is used to designate municipalities of any nature or water districts; g—consumers own a few; h—detector meters on fire supplies owned by consumers; m—survey being made at present.

most permanent are the center or side lines of streets; and the cock may be located as so many feet out from the side (or property) line and a measured distance along such line to the nearest intersecting street line. References to trees may be used, but trees may disappear, as may also buildings; but street lines can always be located. If the service pipe is laid at right angles to the curb (as it usually should be), this sufficiently locates the entire line. If laid at an angle, its intersection with the curb line also should be located. The depth below the street surface at the main and that below the curb should be measured and noted.

There should also be recorded the thickness of lead goose-neck and other pipe used. Some time the pressure on the system may have to be increased, and it will be desirable to know what services probably will and what ones will not be able to stand the higher pressure. The size should be known; it may be necessary to know, at

METERS. RATES. MUNICIPAL USE.

City and state	Is deposit on meter required?	Is rental charged for meters? †	Does city obtain water without payment?	Use made of free water	Used for Municipal Purposes: Percentage	Used for Municipal Purposes: Is any of it metered?
Iowa:						
Boone	No	No	Yes	Flushing & fountains	5	Schools
Burlington	From strangers	No	Yes	Fountains	.....	No
Cedard Falls	No	No	Yes	Street and sewer flushing, fountains, fire	20	Schools
Cedar Rapids	.....	Minium charge	Yes	Sewers, street sprinkling, fire	50	Yes
Creston	.....	.....	No	.....	.....	Schools and street flushing
Ft. Madison	No	No	Yes	Watering troughs	.....	No
Hawarden	Non-owners	$1.00	Yes	Sprinkling and fountains	.....	No
Maquoketa	No	10% of cost	Yes	All city purposes	.....	Schools
Sioux City	.....	.....	Yes	All purposes	.....	Schools
Spencer	No	No	Yes	Sewer flushing, street cleaning, fire	0.5	No
Stanton	.....	.....	No	.....	15	Yes
Vinton	Yes[f]	.....	....	.....	.50	Some
Washington	Yes	No	....	.....	.....	.....
Winterset	.....	.....	Yes	City park	20%	No
Kansas:						
Chanute	Yes	No	No	.....	1	No
Coffeyville	Yes	No	No	.....	5	Buildings
Council Grove	No	No	Yes	Flushing sewers, schools, fountains	10[b]	No
Emporia	No	Large meters only	No	.....	0.5	Yes
Fredonia	$2.25	No	Yes	Flushing sewers and streets, fire	.....	Schools
Great Bend	$2.50	No	Yes	Street sprinkling, park irrigation and all public buildings	60	Yes
Hiawatha	.....	.....	Yes	Fountains, street use, fire	5	No
Horton	Yes	Yes	Yes	Sewers and fire	.....	Schools
Independence	$2.00	No	Yes	Flush tanks, flushing streets, water troughs	.....	Schools
Larned	Yes	No	Yes	City offices	10	Schools
McPherson	Yes	Yes	No	.....	20	Yes
Manhattan	No	Yes	Yes	All municipal purposes	25	No
Neodesha	Yes	No	Yes	Sewers and fountains	.....	Schools
Newton	No	Yes	....	.....	.....	No
Osage City	.....	.....	No	.....	.....	All
Osawatomie	.....	.....	Yes	City building and flushing sewers	5	No
Topeka	No	No	No	.....	60	Schools and parks
Wellington	No	Yes	Yes	Sewers, fountains, parks, cemetery	20	Schools
Kentucky:						
Hopkinsville	Yes	No	Yes	Schools and fountain	4	Yes
Lexington	No	No	Yes	Sewers, street cleaning, etc.	2	All
Louisville	Yes	No	Yes	All municipal purposes	.....	No
Paris	No	No	Little	.....	.....	No
Richmond	No	.....	....	Hydrant rental pays for water used	.....	No
Shelbyville	$5	No	No	.....	10	No
Louisiana:						
Kentwood	.....	.....	Yes	Schools, churches and fountains	5	No
Ruston	No	No	....	.....	.....	.....
Maine:						
Augusta	No	No	Yes	All public uses	.....	No
Calais	.....	No	No	.....	.....	No
Farmington	.....	No	Yes	Flushing sewers	.....	.....
Fort Kent	.....	.....	Yes	Schools	.....	No
Norway	.....	No	No	Watering troughs and fire	Small	No
Van Buren	.....	.....	Yes	Schools and churches	.....	No
Sanford	No	No	No	.....	.....	.....
Maryland:						
Baltimore	No	No	Yes	Schools, streets and fire	14	No
Massachusetts:						
Adams	No	No	....	.....	.....	No
Athol	No	No	Yes	Watering troughs only	10	Schools
Barre	No	No	Yes	Street work	.....	Two schools
Belmont	No	No	Yes	Shade trees, streets, sewers, schools and fire	3	Schools and streets
Cambridge	.....	.....	Yes	All city purposes	4½	All buildings
Cherry Valley	No	No	No	.....	.....	School and water troughs
Danvers	Sometimes	No	Yes	All city uses	.....	No
Falmouth	No	No	No	.....	.....	.....
Fitchburg	.....	No	Yes	All city uses	20	Some
Framingham	No	For over 1 inch	No	.....	16	Yes
Franklin	No	No	No	.....	.....	All but drinking fountains
Haverhill	No	10% of cost	Yes	All city uses	.....	Schools
Lenox	No	No	No	.....	5	Schools & fountns.
Mansfield	No	No	No	.....	15	No
Medway	No	No	No	.....	Small	No
Millbury	No	Yes	No	.....	.....	Bldgs. & fountain
Monson	.....	No	Yes	Street sprinkling, schools, fountain, fire	1	No
No. Adams	No	No	Yes	Schools, public buildings, etc.	10	No
Northampton	No	No	Yes	Schools, public buildings, fountains, water troughs	.....	No
Orange	.....	.....	No	.....	.....	All

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†Amounts given are annual rentals, in some cases reported as quarterly or monthly payments; b—estimated; e—rental charged when bill is less than $9 per annum; f—monthly payments until meter is paid for.

some future time, whether a larger building can be served with the old corporation and service pipe. The material should be on record. Danger from electrolysis, or the desire to use electric thawing of services, may make such knowledge valuable.

Not only should a record be made of the above items, but a record should be kept of the history of each service. For one thing, each service is a potential source of water to some one, and unless the department keeps in touch with each one, some may supply water surreptitiously without yielding revenue. A house may burn down, the service be closed at the curb, and forgotten; a new building may take the place of the old, connect to the old service without notifying the water department or company and use water for years without having a bill presented. A simple system can be devised that will render that impossible.

The superintendent should make sure that the desired notes are made and entered on the records concerning every service connection made while he is in office. If others have preceded him, he should assure himself that their records that he inherits are complete. The only sure way to learn the latter and to check his own records is to have a map of each street in which a main is laid, showing each house supplied by a house connection; check these connections off with his service records, and also learn by actual inspection on the ground whether there are not houses using the public water that are not on the service map.

Unlike valves and hydrants, which are generally at street intersections, services all lie outside of intersections, and can best be mapped and recorded by streets. In the loose-leaf service record book, or card index, one page or card, or two if necessary for long blocks, can be devoted to each block of a street, and all of those referring to each street arranged in order. A convenient plan is to have tracings of these made of note-book size, and from these take blue-prints that can be carried by the inspector. (A transparent card that can be filed in the index, or tracing cloth for the loose-leaf record sheets, would answer well for this purpose.) Changes or new services are all entered in the book or cards. As the blue-prints wear out they can be replaced by printing new ones. All the blue-prints referring to one street, or to several streets in one district, can be bound together in one loose-leaf pocketbook.

With a pocket record of the known service connections, an inspector should pass through each street at least once a year and note whether a service is recorded for each building thereon. If any building, new or old, is found not recorded as served, he should make sure whether in fact such building is not supplied with water from the mains; and should enter the building on the map if it is not already there.

There should also be records of the meters—their size, make, location, etc.; but these records will be considered in a separate discussion of meters and meter maintenance.

SCALES OF MAPS AND RECORDS.

The wall map giving the general layout of mains is generally made on a scale of about 100, 150 or 200 feet to the inch. The first can be used for villages or small cities not more than a mile by three-quarters of a mile in extent. For larger cities the 200-foot scale may still be too large and 300 feet may be used; but this is rather fine for showing sizes of mains and locations of valves and hydrants, and it is generally preferable (and necessary, if the city is very large) to divide the city into sections and show each section on a separate map.

The valve and hydrant records should be to a much larger scale, both so that the locations can be shown to proper scale and so that there will be room for figures giving distances that can be read easily. Ten feet to the inch is generally ample, and is convenient for use with an ordinary foot rule for a scale. Twenty or thirty feet may be used if desired. Forty feet is, in the author's opinion, too small to permit any but an excellent draughtsman to record all the desired dimensions and information clearly. (The reduced drawing of the loose-leaf record book shown last week was 30 feet to one inch, the original having been 10 feet to one inch.)

For the loose-leaf service record book, in which the records are on tracing cloth and blue printe of them are carried in pocket field books, a size of page of 4 by 9 may be used. A scale of 30 feet may be used, which will require two pages to show a block more than about 250 feet long. A better plan, although more expensive, is to use a larger record book in which the drawings are made to a scale of say 30 feet to one inch, and photograph each page to about one-third or one-fourth size, giving a print about 3 by 5 inches, and use prints from these negatives for the pocket field books. Photographs of similar size of the valve and hydrant records, and others of sections of the map, if bound together by districts so that each book contains all the service and valve and hydrant records for one district, with a section of the map covering that district, have been found very convenient for use outside the office.

FIRE-PROOF STORAGE.

These records are of great value, in that the loss of them would render it impossible to operate and maintain the plant properly, except in towns where all the information is accurately carried in the memory of the superintendent, and then only so long as that memory was unimpaired and at the service of the department or company. The map showing the layout of mains can be reproduced, however, if the other records are complete. These record books or card indexes should therefore be kept in a fire-proof vault or safe, and care taken to see that the office is never left alone without all of them being placed in such fire-proof receptacle and the door closed.

GARBAGE REDUCTION AT ST. LOUIS.

We are glad to publish the following self-explanatory comment by director Talbert on the news item that appeared in our April 13th issue:

Editor Municipal Journal,
New York, N. Y.

Dear Sir:

I note in your issue of April 13th an article on page 306 referring to the garbage situation, and in which you state that director Talbert has recommended to the service board that the present high price of grease and fertilizer will compel the city to pay close to $10 a ton for the green garbage delivered to the Indiana Reduction Company and "it will cost the city about $200 a day to conduct the experiment. Talbert says" * * *

The foundation for these figures is the following:

Grease at this time of the year averages about 3 per cent of the garbage, or 60 lbs per ton, which at 12c..	$7.20
Tankage about 10 per cent or 200 lbs—approximate market price $20 per ton or......................	2.00
Total value of products per ton....................	$9.20

Whether this $9.20 of ultimate value is achieved through the present reduction plant or through the experimental plant would in no way affect the net cost to the city of carrying on the experiment, which at the most would be the difference in the total value of the product which might result from the experimental plant being less efficient than the present one, but on the other hand should it prove more efficient there would, so far as the product is concerned, be an actual profit through the experiment.

Yours very truly,
C. M. TALBERT, Director.

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Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

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Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

SEWERS AS A COMMUNITY INVESTMENT.

In an article in this issue citing figures from the latest annual report of the New York State Board of Health, it appears to be demonstrated that, at least so far as New York State is concerned, it pays a community in dollars and cents to install sewerage systems, entirely aside from considerations of the health of its citizens. It can hardly be due to chance only that, averaging 305 villages of that state and considering their growth over a period of 25 years, those provided with sewers are found to have increased in population 45 per cent, while those not so provided increased only 9 per cent. Moreover, many of those provided with sewers increased in population from two to eleven fold, while only two of those not provided with sewers more than doubled in population.

While mere bigness is by no means a virtue, it must be admitted that in most cases a community grows rapidly only when it offers an attraction for outsiders. A growing community is therefore a more desirable place to live in than one which hardly grows at all and does not retain even the normal increase due to the birth rate of its present inhabitants, but is driving away its citizens instead of attracting new ones. Moreover, a city that is not increasing in population is decreasing in property value and in prosperity, and either its taxes must bear more heavily on the citizens who remain, or these must be content to see its streets, its lighting and other public utilities deteriorating.

From the above figures and considerations it would appear that a sewered city, as compared to an unsewered one, is far more likely to be prosperous and attractive as a place for both residence and business purposes. Entirely aside, therefore, from its advantages from the point of view of health, and from that of the economy to the individual citizen as compared to the cost of constructing and maintaining cespools, sewers would seem to be essential to the full prosperity of a community as a whole.

IMPROVING COUNTRY ROADS.

While present indications are that the constructing and repairing of the higher grades of roads, such as brick and other block pavements, bituminous concrete and other forms of construction used on the main highways, will not be so seriously interfered with by freight embargoes, coal shortage and other limitations placed by federal commissions and imposed by war conditions generally as was feared a few weeks ago would be the case, it still seems certain that it will be impossible to carry on as much of this work as in previous years. Another consideration that has an important bearing upon the general question of road improvement is the necessity of economizing in all branches not immediately connected with the conduct of the war, and this will undoubtedly and very properly cause a reduction in expenditures that otherwise would probably be made.

These considerations add additional weight to arguments that were advanced, before present conditions arose, for giving more serious thought to the cheaper methods of road treatment, and to the improvement and maintenance of the by-roads where such cheaper and less durable forms are the only ones which the traffic carried would seem to warrant. The main highways, where the principles of highway economics justify an expenditure of $1.50 to $3 per square yard, constitute but a small percentage of the highway mileage of the country. By far the largest percentage consists of those that may be designated as country roads or by-roads, which are used to only a small extent by through traffic but are essential for bringing onto the main highways, and so to the markets and shipping centers, the produce raised upon the enormous number of farms that have no other outlet, and which serve as the only means of communication that those who live thereon have with the outside world and with each other. It is no more important that motor trucks and other vehicles carrying both freight and passengers should be able to pass freely at all seasons between the main centers than it is that the thousands of farms should be provided with roads that are at least passable during all but perhaps a few days of the year.

The latter roads, however, carry but a small amount of traffic each and no one of them can be said to equal in importance any one main highway, although they all in the aggregate play fully as important a part in the highway transportation of the country. Fortunately it is possible to maintain passable roads for a few vehicles at considerably less cost than to maintain them in an equally good condition under intense traffic. In many sections of the country the main highways have presented such engrossing problems to the highway authorities that these by-ways have been practically neglected; another factor leading to the same condition being that the average engineer or superintendent takes more interest in the construction and up-keep of a high-grade road than in that which he is apt to think of as an unimportant dirt road.

With the amount of high-grade road work diminished, however, it is to be hoped that more attention will be paid this year to dirt, gravel, sand-clay, and other cheap types of road surface, together with such comparatively inexpensive treatments of these materials as will add to their effectiveness. Road drags and other appliances for smoothing out roads and potholes whenever they occur; ditching and drainage for preventing their occurrence; the use of available local materials for improving conditions at boggy places or where ordinary drainage methods are not adequate to prevent rutting and other disturbances of the surface; the application of dust layers or inexpensive binders for preventing the too rapid abrasion of the road and formation of excessive amounts of dust that are not only an annoyance but may also be harmful to growing crops along the road—each of these should be carefully considered in its relation to the local needs and possibilities.

These roads, it seems to us, make up in their number for the relative unimportance of each individually, and instead of being slighted as beneath the notice of experienced road engineers and superintendents, they should be recognized as offering an opportunity for, and demanding an exercise of, more intelligence and skill than do the high-grade roads. It may be said that in laying a road costing $1.50 per yard, five cents worth of brains should go into each yard. We believe that if only a fraction of that amount of brain value be applied to the country roads, it would be possible to put many of them into much better condition than they are in, at very moderate expense; in fact, that if no more is spent on these roads in the aggregate than is now done, but if one cent or even less per yard be allowed for the use of as high a grade of intelligence, experience and common sense as is now used on the more durable pavements, a great improvement could be made in a very large percentage of the tens of thousands of miles of these feeders that constitute the immediate points of contact with the food producing areas of the country.

BRICK PAVEMENTS FOR RURAL HIGHWAYS.

No fundamentally new features have been developed in brick pavements during the past year, said Clifford Older, state highway engineer of Illinois, before the American Road Builders' Association, but "well-directed efforts are being made to adapt this type of pavement to fit the necessities of rural road construction. It has become obvious that paved country roads which connect centers of population, or which serve considerable areas of farming country, will carry as heavy concentrated truck loads as the ordinary city business street, and must be designed accordingly.

"On the other hand, it appears that the chipping or spalling and abrasion action due to sharp shod horses and steel tires is becoming less pronounced, due to the motorization of traffic. When considerable stretches of rural roads become paved, motor traffic may be expected to predominate more quickly than on city streets on account of the greater length of the average haul. A brick wearing surface, laid now, may not be expected to wear appreciably under the traffic conditions likely to apply during its life. The eventual elimination of the spalling action of steel tired, horse-drawn traffic, as such traffic gradually disappears, leads to a tendency to go back to bituminous and sand fillers. As the use of either of these fillers obviously results in reducing the transverse strength or load-carrying capacity of the pavement below that of a pavement of the monolithic type having the same total thickness, the use of these fillers should be accompanied by a corresponding increase in the transverse strength of the base.

"For bituminous fillers, the growing tendency to use three-inch rather than four-inch brick seems logical, as the base, which is essentially the transverse strength element, may be made thicker and therefore stronger without increasing the total thickness or cost of the pavement.

"Three-inch lug brick used with a cement-grout filler, and laid directly on a concrete base or on a sand-cement bed on a concrete base, should give as satisfactory service as four-inch brick used in the same way, providing the total thickness of the pavement and the proportions used in the concrete base are the same. This conclusion is supported by the tests made by Prof. Wiley of the University of Illinois. These tests, while perhaps not conclusive, indicate strongly that the so-called monolithic types of brick pavements are truly monolithic as far as transverse strength is concerned. The three-inch brick used in this way should have ample wearing capacity for present traffic conditions, and has the advantage of economy of first cost. To use the same base for a three-inch as for a four-inch monolithic brick pavement under the same traffic conditions, or to substitute a bituminous filler, would be illogical. The unmistakable tendency to increase motor truck loads requires that more attention be paid to the transverse strength of pavements. Monolithic and semi-monolithic (sand-cement cushion) brick pavements are deservedly becoming popular. The greater difficulty encountered in rolling the brick to an even surface has lead to a tendency towards more rigid specifications for rolling and for brick of more uniform thickness than heretofore required.

"Brick of uniform thickness may readily be handled so as to produce the necessary smoothness of finished surface. The ordinary variation in thickness need present no serious difficulty if the base is carefully laid and the rolling is properly controlled.

"Arguments are being advanced for the use of water-bound and bituminous macadam bases for brick pavements for rural roads. It is the experience of the writer that for heavy motor truck traffic, and under the conditions of frequent rainfall which in Illinois at least makes it difficult and costly to prepare a uniform subgrade, it is economically impracticable to build a road of this character that will not become depressed in the wheel tracks or other well-defined areas. Old macadam roads of proper width and having suitable grades, if not worn out, may well be resurfaced and used for the base, as the weak spots are usually eliminated during the first few years of maintenance. Such roads are, however, hard to find in Illinois.

"There is a definite field for brick country roads where traffic conditions demand wear-resisting qualities, but in the opinion of the writer it would be a mistake to sacrifice any of the distinctive qualities of well-built brick pavements in order to bring them into competition with essentially cheaper types, or for any other reason."

TESTING SEWER HOUSE CONNECTIONS.

A suggestion is made by W. W. Dixon, of Lincoln, N. J., that plumbing codes require that house connections to sewers be tested for tightness under a 10 ft. head like the interior house plumbing, a T branch being inserted in the connection pipe at the curb line at which the pipe can be plugged for the test. (This T could later be used as a clean-out point.) This test would insure tight joints in the connection. We have several times referred to the desirability of having sewer connections tight, to prevent both pollution of the soil and the entrance of tree roots into the pipe. The suggested test would enable the property owner to learn whether the plumber has given him a tight pipe line and seems to us to be a good idea.

The WEEK'S NEWS

War Conditions on Highways of New Jersey, Illinois and New York—State Protects New York City's Watershed—Bayonne to Buy Water Plant—Fuel Conservation in Pittsburgh—New Jersey Cities Lose Rate Increase Case—Fires in Sault Ste. Marie, Ont.; Three Rivers, Que., and New York City—New York Public Service Commission Has No Power to Raise Car Fares—Chicago's Traction Fund.

ROADS AND PAVEMENTS

Road Wear by Federal Trucks.

Trenton, N. J.—Damage done to the roads of New Jersey by motor trucks employed in the government service was one of the subjects recently considered by the state road commission. Watson G. Clark estimated this damage at at least $1,000,000, and recommended that an appeal be made to the federal government for aid in reconstructing roads which have been destroyed in the vicinity of cantonments, military camps and points of embarkation. This view was shared by every member of the commission, and the appeal will be made. The commission decided upon an additional appropriation of $10,000 to improve the Bordentown-Georgetown road leading to Camp Dix in the event of failure to get federal aid for that purpose. Similar action was taken respecting the Lincoln Highway, between Newark and Jersey City, for the repair of which a contingent appropriation of $10,000 was granted. Before this money actually is expended the executive committee will make an effort to secure aid from the government. State highway engineer William G. Thompson informed the commission that owing to change in the date for the opening of the fiscal year, now July 1, from November 1, many of the counties will find it impossible to present plans and specifications and have contracts approved and requisitions drawn for their allotment of state aid before the expiration of the present fiscal year. He has been advised that the state controller's office will permit the highway department to file a blanket requisition June 30, covering the total amount of unexpended state aid, so that none of the counties will suffer. The commission ratified the suggestion of the department of conservation and development for a joint conference to consider plans for beautifying the state highway system by the planting of trees.

War Restrictions on Illinois Highway Plans.

Springfield, Ill.—No new contracts for state roads will be awarded by the division of highways of the state department of public works and buildings this year owing to the shortage of men and material and the need by the government of all the resources to prosecute the war, according to an announcement by the state department of public works and buildings. The department has sent out the following letter to county boards of supervisors and highway officials: "In response to numerous inquiries received from many counties of the state the department of public works and buildings, with the approval of Governor Lowden and the board of highway advisors, is authorized to make the following statement relative to the attitude of the administration on the question of road construction in Illinois during the present year. In view of the serious shortage of labor, transportation and materials that prevails throughout the country and the increasing demands of the government for all commodities in its prosecution of the war, and in accordance with the recommendation of the federal authorities, we believe it to be our patriotic duty to limit our activities in road construction this year as follows: First—To carry on only such maintenance work as is necessary to preserve the roads already constructed under the direction of this department. Second—To assist contractors, so far as we are able, in the completion of existing contracts previously made by this department. Third—To postpone the awarding and approval of new contracts for state aid roads, as advised by the federal government. Fourth—To cooperate with the federal authorities, so far as possible under existing conditions, in the improvement of those federal aid roads which they have approved as being necessary for the transportation of war materials, food products and fuel. We further urge that the present emergency calls for an unusual effort on the part of all township highway officials to maintain existing earth roads by a thorough system of dragging and draining." The letter is signed by Thomas G. Vennum, acting director; S. E. Bradt, superintendent of highways, and C. Older, chief highway engineer.

Law Provides for Suspension of Contracts.

Albany, N. Y.—Governor Whitman has signed the bill of senator Hewitt, amending the highway law by providing that when work under a highway contract is not being done satisfactorily the state highway commissioner may suspend any work being done by the contractor and proceed with it under his own direction, or may cancel the contract or relet it, and further providing for suspension of new highway construction work under certain conditions, upon request of the contractor and surety, until March 1, 1919, or during the present war, if it terminates earlier. Payment may be made for the portion of the work completed. In approving the bill Governor Whitman filed a memorandum of reasons, which stated some of the reasons for its approval given by the highway commission. "There are now upwards of 200 contracts in force, aggregating $12,000,000 in amount and 900 miles in extent. About 600 miles of work yet remains to be done, amounting to about $7,300,000. Of the 600 miles approximately one-half consists of roadway that has not been disturbed and remains as it was prior to the award of the contracts. The remaining one-half consists of roadway in various stages of completion, possibly graded, or bottom coursed, or sub-based. In 1917 the contractors were able to build only 370 miles of highway as compared with nearly 600 miles in 1916 and about 900 in 1915. It was very evident that conditions would be no better in 1918, and therefore no more work could be secured in 1918 than in 1917. It seemed advisable to attempt to concentrate the resources of men and road building materials on the completion, so far as practicable, of the torn-up portions of highway, which, as stated above, aggregate approximately 300 miles, and thus secure the best results for the traveling public rather than attempt to have the entire 600 miles completed, knowing that it would not be possible to accomplish this and realizing that it would leave a large amount of roadway impassable for traffic. The highway law as it now reads does not permit the commissioner of highways to take up the subject in the manner above indicated. It would be his duty to direct every contractor to proceed with his work, and upon his failure so to do declare the contract cancelled and proceed to complete it by reletting or by department forces. The same conditions which would prevent the original contractor from completing his work would have prevented the department, with its own forces or under a new contract, from completing it, and the result would have been that the state would have been strewn with cancelled contracts, under which no work was being performed, and traffic would be greatly embarrassed. After a careful study of the situation a conference was held at this office, at which a representative of the comptroller's department, the attorney-general's department and the executive department were present.

"In substance the bill provides that a contractor may unite with his surety company and request a suspension of work, under the following conditions:

"(1) Upon any portion or portions of roadway on which no work has been performed, except culverts, etc.

"(2) Upon any portion or portions which are partially completed, where it is proved that it is impossible to proceed, for the reasons provided in the law.

"Authorization for such suspension will be based upon an agreement executed by the contractor and surety company agreeing to maintain intact the obligation to complete at a future date the contract at the original contract prices. In the meantime, the commissioner is authorized to designate completion points, and when all the work within these points is finished it may be taken over, the contractor paid in full therefor, and the contractor relieved of the maintenance thereof.

"The period of suspension is to be in the first instance to March 1, 1919. If the war is then in progress, it is extended to March 1, 1920. No provision is made for a later date, it being the theory that the Legislature would then be in session, and could deal with the situation as conditions warranted at that time.

"It will be noted that any cancellation of contracts is in no way contemplated by which the contractor or the surety company is to be relieved in any degree from the contractual obligations now existing. The right to cancel exists upon the failure of the contractor to perform the same, but in that event the contractor and surety company will be held responsible for any excess cost to the state, which may be occasioned by such failure and cancellation.

"While we are not warranted in believing that this bill will relieve all the difficult situations connected with the contracts in charge of this department, yet it is hoped that it will prove a practical solution in a large number of cases. We hope by its provisions to be able to present such inducements to the contractors and the surety companies as will encourage them to make a special effort to complete those portions of the roadway under contract which are torn up and which now impede traffic. If contractors have no alternative but to either complete the entire contract or have it forfeited, there are many cases where they will be positively unable to so complete, and the forfeiture of the contract will accomplish nothing, so far as practical results are concerned, and will merely involve the state in a mass of litigation. In the meantime, the roadway will lie unimproved. A considerable inducement to contractors will exist under this bill as upon the completion of the torn-up portion of the road they will receive their full 100 per cent for all work performed and completed, and will be relieved of the maintenance of that portion of the road. On the other hand, the state, and any political subdivision whose moneys are being used by the department, are protected to the same extent as at present, by the renewed assurance of the completion of the road at the original contract prices.

"While the bill was pending in the legislature a conference was held in the attorney-general's office, at which were present the commissioner of highways, the attorney-general, the state superintendent of insurance, and representatives of all the bonding companies acting as sureties on these contracts. As the result of the conference the surety company representatives stated that they felt the bill was fair in its provisions, and also stated that they would endeavor to co-operate with the state in making it effective."

SEWERAGE AND SANITATION

City Closes Part of War Chemical Plant.

Newark, N. J.—Half of the plant of the Butterworth-Judson Corporation on the Newark meadows, where sixty per cent of the picric acid used in making high explosive shells for this country and the allies is made, closed down for nearly a week when mayor Gillen, health officer Craster and a detail of health officials and police went to the factory and ordered that operations cease until control had been established over acid fumes. Closing of the rest of the plant was considered, but a test performed by the corporation for mayor Gillen, exhibiting the operation of a device that partly eliminated the fumes, proved satisfactory, and operation there was permitted to continue. Nitrous oxide fumes given off at the plant, caused mayor Gillen to take his action upon advice from city attorney Kearns that the fumes constituted a nuisance, and that there was summary power in the hands of the city to abate such a nuisance. "I do not wish to persecute any one, nor to appear in the light of interfering with a necessary industry," said the mayor. "But I feel that these people have been given enough time to abate this nuisance, and we simply had to act. The closed portion of the plant will remain in charge of the health department until such time as the company can satisfy us that adequate measures have been taken to end the nuisance. I shall go personally to the plant daily, ready to be convinced by suitable evidence that the company has met our requirements. Until that time it must remain closed." Chief inspector Brady, with five sanitary inspectors, were left in the shut-down portion of the plant to see that it remained closed. Meanwhile the company rushed work on a tower under construction for the purpose of absorbing the objectionable fumes. Mayor Gillen promised to allow the plant to resume operation as soon as the work was finished and satisfactory. When temporary fans had been installed and the War Department had given assurances that new fans would be rushed, the closing order was rescinded. The company has stated that it will seek redress for losses. The company has been twice indicted within a few months by the Hudson County grand jury for maintaining a nuisance. The company, with its officials, were tried, convicted and fined the first time and has just been indicted again.

Operates Sewer System Without Permit.

Grass Valley, Cal.—The city trustees have received a communication from the state board of health, notifying the city that it has no permit to operate a sewer system, as required by law. The city has maintained a sewer system for nearly fifteen years, not knowing that a permit was needed. It was intimated that radical changes in sewage disposal methods might be demanded by the state board.

Typhoid Traced to Sewer Conditions.

Royal Oak, Mich.—Typhoid fever outbreaks in Royal Oak village are said by state health board representatives to be due not to the water supply, but to the sewerage conditions in the village. Survey of the sewerage system has shown that the village residents are depending in many cases on septic tanks built on low lands, where flood conditions cause trouble, or on open cesspools. The commission is considering a bond issue to provide for a more adequate sewerage system, but concern is expressed as to whether the government will give approval to the bonds. If approval is refused it is likely that an effort will be made to pass an ordinance requiring strict specifications for septic tanks, and enforcing their being built.

WATER SUPPLY

Law Protects New York's Watershed.

New York, N. Y.—Governor Whitman has signed the bill of senator George A. Slater, abolishing the Mohansic State Hospital and the New York State Training School for Boys in the town of Yorktown, Westchester County, and making a state reservation of the property, to be known as the Mohansic Lake Reservation. The bill provides for the abandonment of the project to establish the Mohansic State Hospital for the Insane on a 600-acre tract in the heart of the Croton watershed. It also limits the number of persons that may be placed on the adjacent 500-acre site of the New York Reform School for Boys at Yorktown Heights to fifty. This includes boys, guards and teachers. Originally the Mohansic institution was planned for the accommodation of 6,000 patients and the Yorktown Heights school for 800 delinquents. The governor is to name a commission to have charge of the property, and the members are to serve for five years without compensation. The commissioners may permit establishment on the reservation of places for food and refreshment, golf courses, baseball grounds and children's playgrounds. The commission also is empowered to permit the New York Society for Reformation of Juvenile Delinquents to use part of the land for agricultural purposes. The approval of the bill by governor Whitman means victory in a fight that has been carried on for the last five years by the Merchants' Association, through its Committee on Pollution and Sewerage, of which Edward Hatch, Jr., is chairman. Mr. Hatch, soon after the land for the two institutions had been acquired, took the stand that the location of a hospital and a reform school in the Croton watershed was a distinct menace to the purity of New York City's water supply. Mr. Hatch petitioned governor Sulzer to have the law providing for the location of the two institutions in the watershed repealed on the ground that sewerage from the institutions would imperil the health of New York City. The matter was referred to Dr. Eugene H. Porter, then state health commissioner, who disapproved of the plan. A bill was then introduced repealing the law. It passed both branches of the legislature, but was vetoed by governor Glynn in deference to a request from Dr. Goldwater, then health commissioner of New York City. Dr. Goldwater had acted under instructions from mayor Mitchel, who, like his predecessor in the mayor's office, was in favor of having the hospital located conveniently to New York City. When the dangers were pointed out to mayor Mitchel he promptly reversed himself. Governor Whitman by that time had taken office. He at first opposed any check to the development of the two sites, but he also changed his mind and ordered all construction work stopped. He has remained steadfast ever since in opposition to the pollution scheme despite the fact that political pressure was brought to bear.

City to Buy Water Plant.

Bayonne, N. J.—By a vote of 4 to 1 the city commissioners have passed the ordinance providing for a contract for the city to purchase the property of the New York and New Jersey Water Company for $2,017,000. Mayor Pierre P. Garven voted in the negative. The ordinance provides that the purchase be consummated within twenty days. Petitions protesting against the purchase of the plant without first having the voters approve it already have been placed in circulation, the movement being in charge of county physician Bert Daly, formerly mayor of Bayonne.

City Loses in Waterworks Franchise Case.

Ashland, Ky.—A decision given by the circuit court of appeals requires the litigation between the city of Ashland and the Ashland Waterworks Company to be fought all over again in order to settle whether or not the city is to buy out the company or is bound to grant it another twenty-year renewal of its franchise. Kentucky's present constitution limits municipal indebtedness. The city had the right to buy at the end of twenty years, and on its failure to do so the franchise was to be extended for another period of similar length. The city elected to buy, but could not because the state constitution stops it from issuing the required amount of bonds. The company sued to compel specific performance, but judge Cochran, in the Kentucky federal court, dismissed its case. His decision is now reversed in an opinion favorable to the water company, and a new trial is directed.

STREET LIGHTING AND POWER

Will Not Reopen Rate Increase Cases.

Trenton, N. J.—Application of Jerome T. Congleton, as city counsel for Newark, for a rehearing of the case which led to authority from the state board of public utility commissioners to the Public Service Gas Company and the Public Service Electric Company to increase rates for gas and electricity has been denied by the commission. Mr. Congleton's application was based on an argument that the commission made an order which was to become effective prior to the date of such order, when the statute requires orders of the board, except in certain specified cases, to be made effective not less than twenty days after the date of the order. Mr. Congleton asked the commission to make orders fixing the effective date for the increases in the price of gas and electricity at a time twenty days after the authority was granted to the gas and electric company; that is, twenty days after February 27. Mr. Congleton's case was that the bills of the gas and electric companies carrying the first increase in rates were for gas and electricity furnished to consumers before the date of granting the authority to increase, and that as effectiveness of the authority was made retroactive it was illegal. The utility law specifically provides that orders shall not be effective until twenty days after they are made. In the present case the commission takes the position that an order was not issued in this case and that for this reason the argument advanced by Mr. Congleton for a rehearing is not sound. Disposing of Mr. Congleton's petition, to which the Edison Storage Battery Company was a co-petitioner, the board says that the hearing on the petitions of the gas and electric companies were attended by counsel for many municipalities of the state, and it was distinctly stated that the rates proposed were to be effective to cover meter readings made in the latter part of February and billed on or about March 1, and that this course appeared to meet with the approval of all of the parties present. The board, February 27, concluded to permit the increases proposed and to withhold an order of suspension if the tariffs filed were amended to conform with certain changes suggested by the commission. These amendments were made. No orders of any kind were entered. The commission then says that it appears, therefore, that the billings made subsequent to the filing of the board's reports were under the amended tariffs filed by the companies. "There does not now appear," comments the commission, "any reason for entering any orders. None was needed to make the rates effective. If the board should deem it expedient to enter orders making the emergency orders effective at a future date it has no power to award reparation, even if it should conclude that any rates imposed were illegal. The situation seems to have been understood by all parties at the hearing. It may not be amiss to point out that the granting of the petition would not result in any substantial relief to the petitioner. The rates are purely temporary and for an emergency. The companies were found to require temporary revenues during the calendar year 1918. If the increases were to be applied to the latter months of the year only it appears certain that higher rates would be necessary to afford the needed revenues to cover fixed charges of the calendar year than if they were applied for a longer period of time. In addition to this fact the board is requiring monthly detailed statements to be filed so that adjustments of rates may be made as speedily as conditions warrant. For these reasons it appears that no injury results from the application of the increases to the first readings taken after the filing of the new tariffs. The same reasoning applies to the suggestion that the companies' estimates of taxes paid included assessments which are now subject to attack in the courts. The board will keep check upon these matters and will be guided in the matter of reductions of rates as actual conditions warrant. The companies will not be permitted to receive more than it is shown from inspections of the detailed monthly statements to be required to meet the needs as found by the board and indicated in its reports."

Fuel-Saving Administrator in Pittsburgh.

Pittsburgh, Pa.—The United States Fuel Administrator has announced the appointment of Thomas R. Brown, of Pittsburgh, as administrative engineer for the Pittsburgh district, and C. P. Billing as special staff assistant. These appointments were made as a preliminary step toward putting into operation a general plan for fuel conservation in power plants. The plan contemplates the saving of from 10 to 20 per cent—25,000,000 to 50,000,000 tons—of the coal used annually in industrial plants. This will be accomplished by means of correct operating methods without the delay and expense involved in the installation of new or improved equipment. The program is at present in effect in the Pittsburgh district, which will be used as a model, with the expectation that the campaign for the elimination of waste will be extended to all of the principal coal using districts. The program comprises certain fundamentals: 1—Personal inspection of every power plant; 2—Classifications and rating of every power plant based upon the thoroughness with which the owner conforms to recommendations of the United States Fuel Administration involving the generation and use of power, heat and light; 3—An administrative engineer to be placed in charge of the work in each state or district. It will be one of his duties to rate the plants from information received through reports of inspectors, who will merely act to collect certain definite information regarding each plant.

Company Must Make Extensions.

San Francisco, Cal.—The state railroad commission has authorized the Mount Whitney Power and Electric Company, which sells electricity in Tulare, Kern and Kings Counties, to put into force certain rules for extensions of electric service during the period of the war. These rules obligate the company at its own expense to make all extensions in which the annual gross revenue equals a third of the cost. Where the annual gross revenue is less than the cost of the extension, but more than one-fifth, the company will give the service if the consumer advances the entire cost, which will be refunded to him on the basis of 20 per cent. of the monthly bills. The consumer may at his own cost build enough of the extension so that the amount to be expended by the company shall not be more than three times the annual payment for service by the consumer. The Mount Whitney company is ordered to adjust all extensions made by it within one year prior to this order, if requested by the consumer.

FIRE AND POLICE

Power Plant Destroyed by Fire.

Sault Ste. Marie, Ont.—The Canadian Soo experienced a lightless, powerless day as the result of a fire which totally destroyed the old power plant of the Great Lakes Power Company. The building and contents were valued at $200,000, covered by insurance, and practically everything is a complete loss. Until power could be supplied by the new power plant, which was almost completed, the city was industrially dead. Thousands were out of work. All industries were shut down; no street cars running and no lights operating. The water supply was not affected as the pumps were switched to steam power as soon as the electricity went off. Wards five and six, once Steelton, however, used chlorinated water, as a supply could not be pumped from the old Steelton artesian wells. Steelton had no auxiliary pumps. The fire, it is thought, started from a heated bearing under the floor and spread rapidly to all parts of the building over oil-soaked planking. The operator of the water wheel near where the first flame appeared was powerless to extinguish the blaze, and was driven out by dense smoke fumes. Every fire wagon in the city was at the conflagration. The power franchise was secured some months ago by the Great Lakes Power Company, who now control the power and street car systems. The city owns the water and light business, and was a loser in the fire to the extent of a big transformer at the power plant. Most of the directors of the power company are Americans.

Boston Fire Commissioner Retires.

Boston, Mass.—Fire commissioner John Grady of Boston voluntarily retired this month, on the pension of a chief of the department, which is $2,000 annually, or half the regular pay of a chief on the active list. On May 2 he completed 44 years' service upon the active list of the Boston fire department. During his term the department has been devoid of scandals and friction, there has been general satisfaction among the men of the rank and file, many improvements have been made and the fire losses have gradually and substantially decreased each year. During his term commissioner Grady has handled more than $8,000,000, and at no time has he exceeded his annual appropriation. In the same time the pay of the firemen has been substantially increased, the men have been granted one day off in three instead of one in five as previously, about two hundred men have been added to the fire fighting force, and the new rules and regulations which were begun by commissioner Wells have been revised and put into service. The department has been motorized to the extent of 54 per cent. Many new fire-houses have been built and all old ones have been substantially remodeled and fire-proofed. Commissioner Grady established the officers' school for training superiors of the force, established the rescue squad equipped with gas masks, has purchased a superior quality of fire hose, and the department has also taken over the great work of fire prevention and makes more than 36,000 inspections a year. One reason which influenced commissioner Grady to ask mayor Peters to place him upon a pension is the complete loss of the sight of his right eye, a misfortune of which few persons are aware. On March 10, 1914, the general order placing chief Grady upon retirement was promulgated, but with the provision that he was not to receive his pension until his term as fire commissioner ended. Commissioner Grady was appointed to the department on May 1, 1874. He worked his way along the various grades to chief and commissioner and his is the only instance of the kind in the history of the department.

Town Swept by Fire.

Three Rivers, Quebec.—Fire which broke out in the business section here quickly destroyed forty houses on Bonaventure street, the main business thoroughfare. The flames spread to the nearby streets, and the families were compelled to leave their houses because of the unbearable heat. Help was asked from Quebec and Montreal. Three Rivers, an industrial and manufacturing city of about 10,000 population and a port of entry, is seventy-five miles southwest of the city of Quebec. It was visited by a disastrous fire in 1906, when half of the city was burned.

Many Firemen Injured in Warehouse Blaze.

New York, N. Y.—Fire caused the death of one man and did $500,000 damage in the cold storage warehouse covering the entire city block, owned by the Merchants' Refrigerating Company, and in which were stored large quantities of food and other war supplies belonging to the federal government for transportation overseas. Three alarms were turned in. The fire started in an engine room located in the basement, thirteen feet below the street level, and was caused, it was said, by the blowing out of a cylinder head on a machine which condenses ammonia gas to be forced through the pipes and 140 tanks located in the structure. Four men were in the room at the time of the explosion, which started the flames, and three of them escaped to safety on the street, where they turned in the alarm. The fourth, assistant superintendent, was pinned under falling debris, and his badly crushed body was found after a search of several hours. The rescue squad of the fire department arrived and, donning oxygen helmets, entered the building to search for the missing man, but were driven back by flames and fumes. A second explosion occurred, caused, it was said, by the blowing up of the ammonia tanks. A number of regular army soldiers guarding the waterfront were knocked down by the explosion. Thirty firemen, who were trying to batter down the doors, were thrown off their feet and a number of them injured by shock, flying debris and gassed by the powerful ammonia fumes. Lieutenant George E. McAvoy of engine 34 and lieutenant Thomas Foley of engine 3 were both so badly injured from falling material and ammonia fumes that they were given the last rites. The building, which was said to be the most modern in the United States and one of the largest in the world, was finished only in January.

TRAFFIC AND TRANSPORTATION

New York Commission Powerless to Raise Fares.

Albany, N. Y.—Increased rates in all public utilities, especially in fares on street railways throughout the state, have received a serious setback in the decision of the state court of appeals in the recent Rochester case. According to the decision, the power of the commissions to grant higher fares to deserving railways is in general restricted to those cases where the rates are not fixed in franchises. The court finds that the exisiting public service commission act does not show any intent to provide for the regulation of franchise rates, although it permits the revision of rates fixed by old statutes. Moreover, although it is said to be unnecessary and therefore improper to decide now the limits of legislative power over franchise rates, the court states that such rates fixed in accordance with the constitutional requirement of municipal consent for electric railway operation are not subject to legislative alteration. This decision was handed down in the case of Quinby vs. the city of Rochester. The case came to the court through the denial by lower courts of a writ of prohibition to prevent the public service commission for the second district from exercising jurisdiction over the petition of the New York State Railways for a six-cent fare. The court of appeals decided that the second district commission is without jurisdiction in the Rochester case, and that an absolute writ of prohibition should be awarded. The decision was written by Judge Pound, with Judges Cuddeback, Cardozo and Andrews concurring. Although it expresses the impropriety of now deciding the point, the court intimates that in view of the constitutional requirement in New York for municipal consent to utility operation, franchise rates are unalterable except with municipal permission. The court thus raises the doubt whether the legislature has power to grant relief from franchise restrictions. On the question of whether the commission's jurisdiction is restricted by the Rochester charter amendment which fixes the five-cent fare, the court says:

> "The policy of the state is said to be that the Public Service Commission should deal with the regulation of rates of fare charged by railroad corporations without limitation or restraint, and with the power to increase as well as decrease such rates. (People ex rel. N. Y. & N. S. Traction Co. v. Public Service Commission, 175 App. Div. 869; People ex rel. Ulster & D. R. R. v. Public Service Commission, 171 App. Div. 607, 611; affd., 218 N. Y. 643.)
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> "The section [Section 49, subdivision 1, of the public service commission law], read as a whole, is susceptible of no other natural interpretation than that the Legislature has, for greater certainty, expressly included in its general delegation of powers, the power of the commission to reduce a maximum rate *fixed by the Legislature.* The purpose of the Legislature was to provide for the regulation of statutory fares by a board which may be expected to pass equitably upon conflicting claims with its single purpose the common good, even where a maximum rate had been fixed by the Legislature.
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> "The case of Willis v. City of Rochester (219 N. Y. 427) merely upheld the charter amendment as a constitutional exercise of the legislative power to fix rates. Rates so fixed by special statute are still subject to regulation by the Public Service Commission. The jurisdiction of that body over such rates is not to be reduced by implication. The Legislature merely fixed the rate *pro tempore.*"

Concerning the consent of the local authorities required by the constitution the court states in part:

> "The power of the local authorities to impose as a condition to giving consent to the construction and operation of a street railroad that a stipulated rate of fare should be charged has been repeatedly upheld. (People ex rel. West Side St. Ry. Co. v. Barnard, 110 N. Y. 548; Kittinger v. Buffalo Traction Co., 160 N. Y. 377, 391, 392; Public Service Commission v. Westchester St. R. R., 206 N. Y. 209; People ex rel. Frontier Elec. Ry. v. City of North Tonawanda, 70 Misc. Rep. 91; Alleheny City v. Millville, A. & S. J. Ry., 159 Pa. St. 411.) But these cases dealt with the question of local power over the corporation and not with the question of general legislative power over the municipality. The question presented is this: The consent of the local authorities being obtained, what jurisdiction has the Legislature conferred upon the Public Service Commission to regulate rates by increasing the rate agreed upon without such consent?
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> "It has been held that the Legislature may, by virtue of its general power over municipalities, regulate the mode and manner in which the consent of the local authorities to the construction and operation of street railroads shall be given, and may regulate and limit by statute the conditions upon which it may be given. (Matter of Thirty-fourth St. R. R., 102 N. Y. 343; Beckman v. Third Ave. R. R., 153 N. Y. 144, 152; People ex rel. S. S. Traction Co. v. Wilcox, 196 N. Y. 212.) Regulations are so made in certain cases by the railroad law, Section 173, but that section expressly provides that nothing therein contained shall be construed as modifying or affecting the terms of the contract between the City of Rochester and the street railroad, and it looks to the future and does not attempt to regulate consents already granted.
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> "The Constitution does not expressly provide that the municipality may irrevocably establish rates for the entire period of a franchise, and it has been held invariably and in a legion of cases that such power to establish rates is not essential to the consent of local authorities and will not be implied and that the Legislature is at all times supreme in the matter. (Home Telephone & Tel. Co. v. City of Los Angeles, 211 U. S. 265; Arlington Board of Survey v. Bay State St. Ry., 224 Mass. 463; State ex rel. Webster v. Superior Court, 67 Wash. 37; L. R. A. 1915, C. 287; State ex rel. M. S. R. R. v. P. S. C., 168 S. W. Rep. 1156; City of Manitowoc v. M. & N. Traction Co., 145 Wis. 13; City of Dawson v. Dawson Tel. Co., 137 Ga. 62; City of Woodburn v. Public Service Commission, 82 Ore. 114; L. R. A. 1917, C 98; Collingswood Sewerage Co. v. Borough of Collingswood, 91 N. J. L.).
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> "In all such cases the question was one of unrestricted legislative power, policy and discretion over a city or town where the local authorities were held to be mere instrumentalities through which the state exercised its sovereign power. The paramount power of the Legislature over the subject of fares was upheld in the absence of a constitutional limitation.
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> "But our Constitution, by requiring the consent of the local authorities, recognizes that our municipalities are *pro tanto* independent of legislative control, exercising some fragment of power, otherwise legislative in character, which has been thus irrevocably transferred by the fundamental law from the Legislature to the locality. The grant by the municipality of authority to use the streets is not a mere privilege or gratuity. Once accepted, it becomes a contract which neither the state nor its agencies can impair. (People v. O'Brien, 111 N. Y. 1.)
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> "It is urged by the appellant . . . that the Public Service Commission has no jurisdiction over the subject-matter of rate regulations in the city of Rochester because the Legislature has no power to alter the rates fixed by consent of the company and the local authorities. It is, however, unnecessary and, therefore, improper to decide at this time what the limits of legislative power are in this connection. The delegation of legislative power to commissions and other administrative officers and boards need not be assumed if the general words from which such delegation may be inferred are not reasonably so construed."

Previous to the decision the commission for the second district had awarded fare increases to a number of companies, but to none after it. The commission for the first district had taken the view held in the decision of the court of appeals.

Company's Payments Into Chicago Traction Fund.

Chicago, Ill.—The Chicago Surface Lines, which include the local street car companies, have paid into the city's traction fund for the fiscal year ended Jan. 31, 1918, $2,036,754. This was a decrease of $710,235 as compared with the city's share in the preceding year. With this addition the traction fund reaches to a total of almost $24,000,000, representing 55 per cent. of the net receipts during the last ten years and accumulated interest. If the ordinance under consideration is finally approved it is probable that this money will be used for building subways to be owned by the city and leased to the companies.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Sale of Materials by Councilman.

(Mich.) Member of common council selling materials to contractor without any previous agreement or understanding held not interested in the contract with the city within the prohibition of Grand Rapids City Charter, §498.—People v. Southern Surety Co., 165 N. W. 769.

Police Pensions—Repeal of Statute.

(Cal.) Where pensions for policemen are predicated merely upon death occurring during period of service, and death only fixes the right to a pension, a repeal of the pension statute before death destroys the pension right.—O'Dea v. Cook, 169 P. 366.

Municipal Plants—Management—Court Jurisdiction.

(Ohio) Courts cannot interfere with municipal officials' management of light, power and heating plants on complaint that capacity of plant is overtaxed, that streets are insufficiently lighted because of light supplied to private consumers, and that rates charged are inadequate to meet cost of production and transmission.—Butler v. Karb, 117 N. E. 953.

Under Gen. Code, §3618, and section 3939, subd. 12, as amended by 105-106 Ohio Laws, p. 538, powers of municipalities to establish and operate lighting, power and heating plants, and furnish the municipality and its inhabitants light, power and heat are proprietary, and in the management of such plant municipal officials have a wide discretion.—Id.

Police Pensions—Removal—Reinstatement.

(Ill.) A police captain held entitled to a pension under Pension Act, §§3-6, notwithstanding removal under the Civil Service Act of June 10, 1911.—Stiles v. Board of Trustees of Police Pension Fund of West Chicago Park Commissioners, 118 N. E. 202.

An applicant for police pension under Pension Act does not waive his right thereto because he has brought suit for reinstatement on the police force.—Id.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

May 15-22.—NATIONAL CONFERENCE OF SOCIAL WORK.—Annual conference, Kansas City, Mo. Secretary, William T. Goss, 315 Plymouth Court, Chicago, Ill.

May 20-22.—SOUTHEASTERN SANITARY ASSOCIATION. Annual meeting, Knoxville, Tenn. Secretary, Dr. Charles E. Smith, Greenville, S. C.

May 21-23.—ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Annual convention, Hot Springs, Ark.

May 27-June 1.—CANADIAN PUBLIC HEALTH ASSOCIATION. Meeting with Ontario Health Officers' Association, Hamilton, Ont. Secretary, J. G. Fitzgerald, Toronto, Ont.

May 27-29.—NATIONAL CITY PLANNING INSTITUTE. Annual conference, St. Louis, Mo. Secretary, Flavel Shurtleff, 19 Concress Street, Boston, Mass.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, P. O. Box 1015, Washington, D. C.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 5-7.—NATIONAL MUNICIPAL LEAGUE. Annual meeting, New York, N. Y. Secretary, Clinton Rogers Woodruff, North American Bldg., Philadelphia, Pa.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 11-13.—MAYORS AND OTHER CITY OFFICIALS OF NEW YORK STATE. Annual conference, Newburgh, N. Y. Secretary, William P. Capes, 25 Washington St., Albany, N. Y.

June 19-21.—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual meeting, Atlantic City, N. J.

June 19, 20.—LEAGUE OF TEXAS MUNICIPALITIES. Sixth annual convention, in cooperation with the Texas Commercial Executives' Association, San Antonio, Tex. Secretary, Edward T. Paxton, University of Texas, Austin, Tex.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Institute of Electrical Engineers.

The thirty-fourth annual convention of the American Institute of Electrical Engineers will be held in the Marlborough-Blenheim Hotel, Atlantic City, N. J., June 26 to 28. A large attendance is expected because of the importance of the topics to be discussed, these dealing chiefly with problems connected with the generation and transmission of electrical energy. The tentative program of papers and addresses is as follows:

Wednesday, 10:30 a. m.—Opening address by President E. W. Rice, Jr.; reports of technical committee.

Wednesday, 2:30 p. m.—"Split-Conductor Cables—Balanced Protection," by William H. Cole; "Overhead Transmission Cables," by E. B. Meyer; "The Application of Theory and Practice to the Design of Transmission-Line Insulators," by G. I. Gilchrist.

Thursday, 10:30 a. m.—"Lightning-Arrester Spark Gaps," by C. T. Allcut; "The Oxide—Film Lightning Arrester," by C. P. Steinmetz; "Design of Transpositions for Parallel Telephone and Power Circuits," by H. S. Osborne.

Thursday, 2:30 p. m.—Conference of section delegates.

Thursday, 8:30 p. m.—"Fixation of Nitrogen," by E. Kilburn Scott; "America's Power Supply," by C. P. Steinmetz.

Friday, 10:30 a. m.—"Precharged Condensers," by V. Karapetoff; "Method of Symmetrical Co-ordinates Applied for the Solution of Polyphase Networks," by C. L. Fortescue; "Flux Distribution in Alternators Under Sustained Short-Circuit Conditions and Different Loads," by N. S. Diamant.

Friday, 2:30 p. m.—"Protection from Flashing in Direct-Current Apparatus," by J. J. Linebaugh and J. L. Burham; "The Automatic Hydroelectric Plant," by J. M. Drabelle and L. B. Barnett.

National Electric Light Association.

A meeting of all of the electrical interests on the Pacific Coast was held in Del Monte, Cal. The National Electric Supply Jobbers of the Pacific Coast met there on Monday, May 6, the California Association of Electrical Contractors and Dealers convened on Tuesday, and the delegates of the National Electric Light Association arrived on Thursday. Some of the important papers presented were: "Possible Water-Power Development in California," by F. H. Fowler; "Joint Operation of Power Companies," by J. P. Jollyman; "Power-Plant Losses," by R. J. C. Wood; "Transmission and Distribution Losses," by R. E. Cunningham; "Iron and Steel Conductors," by R. C. Powell; "Standardization of Pin-Type Insulators," by L. M. Klauber and R. E. Cunningham; "Substitute for Cedar Poles," by L. M. Klauber, and "Insulator Deterioration," by J. A. Koontz. There were also papers on commercial, accounting and contractors' problems.

Southwestern Electrical and Gas Association.

Four addresses and two papers were features of the opening sessions of the recent fourteenth annual convention of the Southwestern Electrical and Gas Association in Hotel Galvez at Galveston.

The address of welcome was delivered by mayor I. H. Kempner. Response was made by W. B. Head, of Dallas, vice-president of the Texas Power and Light Company. H. C. Morris, president of the association and vice-president of the Dallas Gas Company, spoke on the manner in which the war has affected the gas and electrical business. Lynton T. Block, president of the Employers' Indemnity Association of St. Louis, delivered an address on "The Possibilities of Jovian Insurance." Edward F. Harris, of Galveston, delivered a patriotic address on "War Savings, the Solution of Our National Problem." Mr. Harris was given a rising vote of thanks upon completing his remarks. F. I. Weisser, superintendent of the gas department of the San Antonio Public Service Company, read a paper on "The Manufacture of Balloon Gas." The paper was filled with interesting information and was a feature of the opening session. H. E. Danner, commercial manager of the Houston Gas and Fuel Company, read a paper on "The Commercial End of the Gas Business."

The Street and Interurban Railway Section session was held at 2 p. m. that afternoon. The Gas Section session was held at 2. p. m. in the Gold Room at which F. D. Murphy, general manager Houston Gas & Fuel Company, was chairman. "The Commercial End of the Gas Business," by H. E. Danner, commercial manager Houston Gas & Fuel Company; "The Manufacture of Balloon Gas," by F. L. Weisser, superintendent gas department, San Antonio Public Service Company; address, "What Will Be the Next Turn in the Gas Business?" by the chairman; question box and discussions; new questions brought in by members; election of section chairman.

At the second day's session reports were made by H. S. Cooper, secretary of the executive committee, during which he displayed a geological map of Texas, in which the locations of the lignite beds were shown. These beds were found to be located near the cities where the largest public utilities plants in the state are being operated. Mr. Cooper said that the deposits would be useless unless steps were taken to make the fuel easier to handle. Upon suggestion of H. C. Morris, of Dallas, the committee agreed to consider sending two young men to the University of Texas to take a special course in geology to find a solution of the fuel problem through the lignite beds.

The question of increasing rates was discussed by nearly every one in attendance. The prevailing opinion was that eventually the rates must be raised because of the increased costs of labor and fuel. J. C. Kennedy, of Brenham, reported that some concerns have increased their rates without receiving complaints from the public. Others maintained that in nearly every instance the public probably would complain if the rates are increased, but that the public must be educated to the fact that it may be necessary to increase the rates on account of conditions being abnormal.

The question of obtaining sufficient labor during the war also was discussed. The delegates said that they were making the best of conditions under the circumstances, but all of the companies which they represent have

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INDUSTRIAL NEWS

Cast Iron Pipe.—Government prices remain constant. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A $1 extra.

The Brown Hoisting Machinery Co., Cleveland, O., announces that H. D. Wright, manager of its San Francisco office, Monadnock Building, is appointed Pacific Coast representative, succeeding the Colby Engineering Co. in the Northwest territory.

The Luitweiler Pumping Engine Co., Rochester, N. Y., announces the opening of an office in Chicago in charge of T. M. Weinstein, a factory representative of the company.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., has issued Bulletin No. 241, listing its latest bargains in rails, cars and locomotives. Those in the market for such equipment should go through this bulletin before the opportunities are missed.

War Needs and the Steel Situation.

Every ton of steel and pig iron in the country virtually has been commandeered by the government for war purposes, and any surplus remaining after war needs are met, will be distributed to non-war industries under strict government supervision. This was learned officially following publication of minutes of a meeting attended by the chief steel men of the country.

Eight thousand tons of pig iron were taken from a large mill engaged in less essential work and shipped to a steel mill doing war work, which was about to close down because of pig iron shortage. Similar action has been taken more than once during the last few weeks, and the practice will be continued whenever steel mills and plants engaged in non-war work have steel for the government's war requirements.

A meeting of about fifty of the principal steel manufacturing companies, called at the request of Mr. J. L. Replogle, Director of Steel Purchases of the War Industries Board, was held recently at the office of President E. H. Gary of the American Iron and Steel Institute in New York, at which Mr. Replogle made a strong statement of the immediate and future requirements of the Government for steel in various forms for its military necessities, stating that they are so great as to demand the entire output of the industry in almost all lines. The manufacturers responded to Mr. Replogle's appeal for maximum production in the most patriotic spirit, and pledged themselves unanimously to give their best efforts to accomplishing maximum production, subordinating all commercial business to the Government's requirements. Every member of the American Iron and Steel Institute has been asked by Judge Gary to sign two copies of the pledge as adopted, to return one to James T. McCleary, secretary of the institute, retaining the other.

The pledge as signed by those who attended the meeting is as follows: "For myself, my corporation or my firm, I pledge the prompt production and delivery of the largest possible quantity of material in our departments that is or shall be required by the United States Government for the necessities of itself and its Allies, and agree that all other lines of our business shall be subordinated to this pledge, and all this in accordance with the request of the War Industries Board."

Data was presented by Mr. Replogle, relative to the present and prospective demand of the Government's shipbuilding program, also the steel plate demand that must be met from Allied countries, including 300,000 tons for Great Britain, 200,000 tons for Japan, 60,000 tons for Italy, and a considerable amount for Canada. The requirements of the car and locomotive program were also discussed and the measures which have been taken to reduce the amount of plates required for the new cars. Mr. Replogle urged that steel manufacturers concentrate upon government and other war steel, and on the railroad and equally important demand of essential industries, such as implement manufacture, mining of coal and other minerals, oil well work and industrial structural work resulting from the war. He made it plain that war and railroad demand would soon call for far more steel than the manufacturers had appreciated. He emphasized the shortage of steel plates up to this time, and indicated that full operation of plate mills on government and allied orders was essential for a considerable time, suggesting that to do this it might be necessary to ship pig iron from one district to another as well as steel ingots from works now devoted to other products than plates, so that plate mills and their connected steel works could run to their utmost capacity.

It is estimated that in spite of shortages of coke, pig iron, labor and transportation facilities, shipments of finished products for governmental and other essential purposes are being made at the rate of approximately 33,000,000 tons per annum.

The steel trade has a general understanding that the United States Government has planned and now has under construction a big building program covering shops, warehouses and other structures, but it is not believed that any one outside the circle of the War Industries Board knows that during the current year the government will use 20 per cent more building material, including structural shapes, than the average consumption of the entire country during the three years 1914, 1915 and 1916.

The recent meeting is accepted as marking the beginning of a move to classify steel-using industries, to develop a preferential list and to apportion output among both the essential and less essential industries.

NEWS OF THE SOCIETIES

(Continued from page 422)

lost many capable employes on account of the draft. Some of the companies are training men who are not subject to draft to take the places of men who have been called.

R. W. Van Valkenburgh, of Dallas, Texas, general manager of the Western Electric Company of Texas, read a paper on "Suggestions for Conservation in Purchasing from the Seller's Standpoint." The paper contained suggestions that might be used by the sellers and pointed out the necessity of conservation. The paper was followed by discussions on the subject.

The election of officers for the ensuing year resulted as follows: President, W. A. Sullivan, Shreveport, vice-president and general manager of Shreveport Railway Company; first vice-president, Burr Martin, Dallas, general manager of Texas Electric Railway; second vice-president, E. S. Fletcher, general superintendent of Texas Power & Light Company, Dallas; third vice-president, A. Hardgrave, chief operating engineer of Southwestern Utilities Company; treasurer, J. B. Walker, Dallas; secretary of executive committee, H. S. Cooper, re-elected.

Oklahoma Gas, Electric and Street Railway Association.

The Oklahoma Gas, Electric and Street Railway Association recently held its seventh annual convention at Oklahoma City. A number of matters of vital interest to the public utility companies were considered in the addresses, papers and discussion. In order to properly gather and disseminate facts of interest to companies and persons supplying utility service, the convention decided that the association employ a secretary for such work. The selection of a secretary was placed in the hands of the state executive committee of which John W. Sharlet is chairman.

The first session met on Monday afternoon. Mayor Overholser of Oklahoma City made an address of welcome, and F. D. Shaffer, manager of the Chickasha Gas & Electric Company gave his presidential address, the keynote of which was co-operation on the part of the utilities of the State to relieve the present financial stringency and effectually prosecute the war.

C. W. Shannon read a paper on "The Reliability of the Oklahoma Oil and Gas Fields." Mr. Shannon predicted that in the near future it would be possible to predetermine the life of Oklahoma oil and gas wells. The convention then adjourned to inspect the new waterworks project built for the supply of Oklahoma City at a cost of $1,500,000.

The second day's session was featured by the following. Electric Railways and the War—Guy B. Treat, chief engineer, Oklahoma Railway Company; Oklahoma Utilities and the War—Prof. L. W. W. Morrow, University of Oklahoma; High-Tension Transmission and Distribution—Lee Boyer, engineer, Choctaw Power & Light Company; Gas-Fired Boilers—L. A. White, superintendent, Muskogee Gas & Electric Company.

Interesting discussion followed the address under each heading.

John W. Shartel thought the adoption of a six-cent fare would hardly solve the problem and that a cut in the service seemed the logical step to meet a situation caused by advancing prices of everything that the railway company uses in operating.

After hearing the papers of Guy B. Treat, chief engineer of the Oklahoma Railways Company, and Prof. L. W. W. Morrow of the University of Oklahoma, the convention went on record in support of the National Committee on Public Utility Conditions appointed by the National Electric Light Association, the American Gas Institute, the National Commercial Gas Association and the American Electric Railway Association. It passed a resolution to the effect that the Oklahoma sub-committee of the national committee be empowered to engage a high-grade man to handle the work of the associations in Oklahoma in connection with the granting of rate increases, the obtaining of financial aid from the War Finance Corporation and the obtaining of proper publicity for the utilities in the state, and in other ways to advance the interests and promote the welfare of the individual members of the association.

In discussing the papers, the consensus of opinion was that a rate increase was the only solution of present financial problems, and that such an increase ought to be granted upon proper presentation of facts with a minimum delay.

At the afternoon session C. S. Thompson and J. W. Shartel discussed the advisability of concentrated production, transmission and distribution of electricity in Oklahoma through the use of a few large stations.

The discussion of the paper by L. A. White, entitled "Gas-Fired Boilers," dwelt on the fact that a large combustion chamber was the essential prerequisite for the efficient use of gas under boilers.

At the Tuesday morning session L. E. Mohrhardt read a paper on the use of electricity in the oil and gas fields of the state. Discussion brought out the point that the load obtainable in the oil and gas fields would be advantageous to central-station men from every standpoint, but that there had been no attempt to get this load. One of the difficulties is the necessity for costly equipment and high-tension lines.

On the closing day the interest centered on the subjects treated in the following addresses: Needed Utility Legislation—Chas. Hoopes, assistant operating manager, Oklahoma Railway Company; Utility Taxation—Prof. F. F. Blachly, University of Oklahoma; Relations of the Utilities and the Public—A. L. Mitchell, engineer, Corporation Commission; Relations to Customers—W. T. Dibbens, manager, Guthrie Gas Company.

In the course of the discussion the habit, in some quarters of stealing electric current, gas and water was repeatedly referred to. One speaker said the opinion that stealing from a corporation was not a serious offense had become entirely too popular; and legislative action was asked to provide a specific penalty for offenses of this kind.

Discussion also developed a demand for a state law to license engineers of public utility plants.

PERSONALS

Cochrane, Victor H., engineer of bridges of Kansas City, Mo., has been appointed major in the quartermaster corps, National Army, and has been assigned to duty in connection with the construction division, Washington, D. C.

Durkin, W. H., engineer of the department of public sanitation, Indianapolis, Ind., has become a member of the engineering staff of the Industrial Bureau of Housing, Washington, D. C.

Goldsmith, Clarence, whose services during the past year have been contributed by the National Board of Fire Underwriters to the Government as advisory engineer on water supply and fire protection, has been commissioned as major in the quartermaster corps, construction division, of the National Army.

Learned, Albert P., who has been for five years assistant engineer with the consulting engineering firm of Black & Veatch, Kansas City, has been commissioned first lieutenant in the sanitary corps of the National Army and stationed at Camp Greenleaf, Chickamauga, Georgia.

McCabe, Arch., has been appointed chief of the Muncie, Ind., fire department to succeed John E. Casey, who has entered federal government service.

McKenzie, James, has been appointed county engineer of Morris County, Kan.

Whitten, Dr. Robert H., has been appointed consulting engineer to the city plan commission of Cleveland, O. He was until recently secretary of the city planning committee of New York City.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Chester, Pa., is building a PARK BRIDGE. Plans and specifications for the structure were prepared by the engineer, James B. Long.

Plans are being drawn for a WATERWORKS PLANT for Bellefield, N. D., by the consulting engineer, L. P. Wolff.

Bryan, O., is to improve its WATERWORKS. A. H. Smith has been selected as the engineer to prepare plans and specifications.

STREET and SEWER IMPROVEMENTS are to be made by Mingo Junction, O. The engineer for the work is W. R. Walker.

A SEWER SYSTEM is to be constructed by Platte, S. D., plans and specifications for the improvement being in the course of preparation by the engineer, W. L. Bruce.

In making ROAD IMPROVEMENTS Lincoln, Price, Forest, Oneida and Langlade Counties, Wis., have had plans prepared by the engineer, H. Nelson.

Charlotte, N. C., is to improve its WATERWORKS by the installation of new pumping equipment. The municipal engineering firm of Anderson & Christie prepared the plans and specifications.

Troy, N. Y., is contemplating PARK DEVELOPMENTS. Preliminary plans for the improvements are being drawn by the landscape architect, Charles D. Lay.

The civic planning commission of Salt Lake City, Utah, has retained George E. Kessler, city planning expert and landscape architect, to develop a CITY PLAN.

Paris, Kan., is to construct WATERWORKS. Plans for the improvement have been completed by the consulting engineering firm of Winters & Dove.

Sandpoint, Ida., has voted $140,000 bonds for the construction of WATERWORKS. The consulting engineering firm of Burns & McDonnell is to have charge of the improvement.

The Arkoe (Mo.) Drainage District is to make some RIVER STRAIGHTENING and DRAINAGE improvements. Plans are in process of preparation by the consulting firm of Leslie-Barnes Engineering Co.

An experimental WATER FILTRATION and DISINFECTION PLANT is to be installed by Milwaukee, Wis. Joseph W. Ellms has been retained as consulting engineer to design the plant and have charge of the experimental work.

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WATER-WORKS OF COLORADO SPRINGS

Freezing and Thawing of Services, Hydrants and Mains—Prevention of Freezing by Increasing Depth—Source of Supply on Slope of Pikes Peak—Water Shed Fenced and Guarded.

LAKE MORAINE STORAGE RESERVOIR. CARETAKER'S RESIDENCE IN FOREGROUND, MT. BALDY IN BACKGROUND.

Colorado Springs has an estimated population of 35,000, of which about 33,000 are reached by the lines of the water works distribution system and all make use of the public supply. The supply is obtained by gravity from a water shed on the south slope of Pikes Peak, which is impounded in a number of lakes and reservoirs. The highest of these, known as reservoir number 7, has an elevation of 12,109 feet and a capacity of 75,000,000 gallons. The outflow from this lake is lead by a flume to another lake 260 feet lower, which also receives the flow from reservoir number 8 through a tunnel over 6,000 feet long. From here it flows through a succession of lakes and reservoirs, part of the distance in natural channels and part in pipe lines. All of these reservoirs and the routes followed by the streams and pipe lines are on city property down to the intake, about six miles from the city.

The drainage area from which the supply is drawn covers 29 square miles. The supply is almost entirely melted snow stored on granite. From the last storage reservoir, Lake Moraine, which has an elevation of 10,246 feet, the water flows over granite boulders with a drop of about a thousand feet to the intake, thus being thoroughly aerated. The city has acquired all the land draining into the various streams of the system, most of it by purchase from the government at $1.25 per acre. That which did not belong to the government, but was owned by private parties, was bought at the best prices obtainable. The land purchased from the government was acquired before the adoption of the present national forest policy. National forest land cannot be purchased now, but the Forestry Department will set land aside for water-shed use of a city or town, and will protect it. The Forestry administration has made great progress along this line during the past few years. A city can adopt its own laws to govern its own water shed and have its own employees enforce them, if desired. The Forestry Department will meet more than half-way any community that wants to protect water-shed land which is under the control of that department. Colorado Springs has had 10,000 acres on the north slope of Pikes Peak set aside for future development under an agreement of this kind.

Of the 29 square miles of drainage area, the city has fenced in 7,500 acres, or about 12 square miles, with a five-wire barbed fence, all of the storage reservoirs being within this fenced area. A caretaker and guards are kept at the various reservoirs, their duties being to see that no one trespasses upon the city land. No one is allowed upon the water shed without a permit, and permits are issued by the superintendent only. During 1917 only 34 permits were issued and most of these were to relatives of the caretakers. Before anyone receives a permit, the state of his health is investigated; if he has ever had typhoid fever, no permit will be granted, as the city will take no chances of a typhoid carrier visiting the water shed. All caretakers are examined by the city's physician before they go to work. No stock grazing is allowed upon the area.

With all these precautions the city believes that it obtains pure water in the reservoirs, that it is protected from pollution throughout its entire travel through them and to the city, and that no supply in the country can surpass it in quality and safety. During 1917 the monthly average of total solids ranged from 44 to 54 parts per million; the organic and volatile matter varied from 9 to 14 parts, and the total hardness from 10.7 to 19.1 parts. Of free and albuminoid ammonia there were only traces during most of the year, measurable quantities appeared during May, June, July and August, with a maximum of .002 parts. The bacteriological examination showed the colonies at 37°C. varying from a minimum of 6 in September to a maximum of 20 in July, the average being 12. The 22° colonies varied from a minimum of 60 in February to a maximum of 162 in July. Tests for bacilli of the Colon group were negative in every instance except on July 20th and August 8th. The average temperature of the tap water was 56.5°, varying from 48.2°, the average for March, to 64°, the average for July.

The water so collected, after reaching Lake Moraine reservoir and being aerated in the thousand-foot fall previously referred to in Ruxton creek, enters a 14-inch pipe line in which it falls about 2,500 feet to a "settler." From this point it is carried in 16-inch, 14-inch and 12-inch pipe lines to the city. In the city are two small reservoirs, one of about 12,500,000 gallons capacity and the other 15,000,000 gallons, each having an elevation of 6,226 feet. In the southeast corner of the city is located the Prospect Lake storage and irrigation reservoir, with an elevation of 6,097 feet and a capacity of about 374,000,000 gallons. On the water shed there are six storage reservoirs, varying in size from 62,000,000 gallons to 864,544,000, and varying in cost from $22,000 for the former to $177,000 for the latter. On December 31st there was in storage in these mountain reservoirs 1,582.5 million gallons, while in Prospect lake and another reservoir an additional 350,000,000 gallons were stored for irrigation purposes.

The distribution system contains about 150 miles of mains, of which nearly 6 miles were laid last year, the sizes varying from 2 inches to 24 inches. Cast iron and steel are used for the mains. Of the total 150 miles, a little over 21 miles is less than 4 inches in diameter. The pressure on the mains varies in different parts of the city from 40 pounds to 150 pounds. There are connected to the distribution system 518 fire hydrants, both public and private, and 1954 stop gates. There were in use, at the end of the year, 12,224 service taps, 265 of which were metered. Although only about 2 per cent of the services are metered, about 26 per cent of the receipts is obtained from metered water. All establishments or buildings using large quantities of water are required to take the same through meters, and the mayor, as commissioner of water and water works, can order the installation of meters on any service and the payment by meter rates instead of by flat rates.

The total consumption for the year averaged 6,054,504 gallons per day, equivalent to 180 gallons per inhabitant, 183 per consumer and 495 per tap. The cost of supplying water per million gallons, figured on the total maintenance expense plus one per cent of the value of the system as a basis of depreciation, was $31.98; while the cost, figured on maintenance, depreciation and interest charges, was $55.77. The value of the water system is figured at $3,355,227, that of the buildings at $22,600, and that of equipment and supplies at $39,214. The outstanding bonds total $1,450,400. The total income in 1917 was $161,252, and the total expense, including interest on the water bonds, was $89,047, leaving an excess of income over expenses of $72,205. Of this amount $44,355 was placed in the sinking fund.

The ordinances and regulations of the Department of Water and Water Works specify, as one of the duties of superintendents of water works, that "he keep correct and complete details of the water works system and of all construction and other work connected therewith and all fire hydrants, pipes and valves." This is the kind of clause that was suggested by us in the May 11th issue as one that should be entered in every by-laws or contract in which are specified the duties of a water works superintendent, in order that the city may not only require the superintendent to keep such records, but may legally claim ownership of the same.

THAWING MAINS, HYDRANTS AND SERVICES.

The superintendent of the Colorado Springs water works, B. B. McReynolds, to whom we are indebted for the above information, has at our request described for us the methods employed by him for thawing services, mains and fire hydrants. As all parts of Colorado Springs are more than 5,000 feet above sea level, while the latitude is that in which cold weather may be expected, the temperature frequently falls to that which might be expected to give trouble with freezing. Superintendent McReynolds describes his methods as follows:

During my first year as superintendent (I have been in charge of the Colorado Springs water system since 1909), we had several blocks of mains frozen and some hydrants, although the winter was not an extremely cold one. Our winter weather here has a wide range of temperature, many days of mild temperature being followed by a sudden drop. The cold periods run from one to two weeks, the temperature ranging from 40° above to 10° below zero, with 30° reached some nights but not often. Frost has been known to penetrate to a depth of 44 inches.

During that winter I found that the frozen mains were shallow ones, in some cases with not more than 24 inches covering. It had been assumed that there would be enough circulation to keep the shallow mains from freezing, but this was not the case. Following this experience, our practice now is to lower all mains below the frost line, giving every pipe five feet of covering, and insisting that all service lines be at least 4½ feet below the surface. If the street department should lower a street grade, we lower our main immediately and do not wait to see whether or not it will freeze the next winter. No mains have frozen since 1910.

There have, however, been frozen services, usually where a gutter has washed out. The consumers install and maintain the service lines all the way out to the main, the services being put in by licensed plumbers. It is difficult to get consumers to insist upon proper depth for their service pipes; in some cases where the danger that a shallow service will freeze is pointed out to him, he has replied, "She didn't freeze last winter and I don't believe she will this one." Some morning he wakes up with no water and calls up the department and wants to know why he can't get any water. We then put it up to him to call in a plumber and have his pipe thawed out and lowered.

We do not at all sanction the practice of thawing services by electricity or steam, except in cases of necessity where the consumer must have water at once. The idea of a water department advocating thawing services by a method that does not require digging them up and lowering them seems to me a very poor one. If thawed in this way and left with the danger of freezing as great as ever, the consumer wastes water the rest of the winter by keeping his faucets open to prevent freezing. We have enough trouble to keep consumers from wasting water in this way when their pipes are deep, without encouraging them to do so. I think any practice is wrong that does not remedy the fault. It may cost a few dollars more to thaw a service by digging it up and lowering it, but when you have done this you have removed the danger.

Fire hydrants we inspect every three months. In October we inspect, oil and grease them, using a small quantity of graphite grease on the nozzle threads so the caps will not stick, see that the hydrants drain properly, and that everything is in first class shape. If at any time after this the hydrant is opened, we inspect it again. During the winter, or until April if we have a normal cold period, we inspect the hydrant and put one-half pint of shaved soap in each hydrant. The soap we buy in barrels, such as the laundries use. In extreme cold periods we put one pint of common salt in each hydrant. After the cold period is over (in our county it never lasts over two months) we flush the salt out. It is our opinion that the salt solution is hard on the metal and that soap is absolutely harmless, so we use soap until the temperature reaches 15° below, and after that use salt. Also, we use salt where we find a hydrant that drains a little slowly. When we do have a hydrant freeze (and this happens sometimes), we use steam to thaw the hydrant and build a fire around it to draw the frost out of the ground. After this treatment we have no more trouble with that particular hydrant.

SEWER PIPE JOINTS*

Experiences with Sulphur and Sand, Asphaltic and Linseed Oil Compounds—Data Relative to Practice in Fifteen New England Cities.

Henry A. Varney, city engineer of Brookline, Mass., had tried the sulphur and sand joint and by its use had greatly reduced the amount of leakage, but was "apprehensive that such a rigid joint as this material makes from the moment it is poured would result in cracks in the bells or the pipe itself, for it is difficult to bed several lengths of pipe so as to prevent all possibility of movement when the backfilling and puddling are completed."

Bertram Brewer, city engineer and superintendent of water works and sewers of Waltham, stated that for wet ground that city had used both sulphur-sand and asphaltic joints and preferred the latter. The sulphur-sand joints were first used in 1907, but their experience indicated that the joint was too rigid. "The writer has never yet seen a sewer where there was not some movement of the pipes after they were laid. It might be only very slight and, with care, it need be only very slight, but in the case mentioned, where there was no appreciable change and the pipe was subjected to very little stress, failure resulted. Further experience goes to show that the decision to abandon the use of the sulphur-sand joint was a sound one. In 1917, a 300-ft. line of 5-inch pipe laid ten years before, where the joints were of the type now under consideration, was taken up and re-laid at a lower level. When excavated, this sewer to all appearances was at a true grade and perfectly sound; but when jarred out of line, over one-third of the pipes were found to be completely fractured at the back of the bell. The annular cracks were so fine that they could not be seen until the sewer was moved."

Frank R. A. Marston, designing engineer with Metcalf & Eddy, reported that that firm had used the sulphur-sand joints on several contracts. "Unless the sand is very fine and practically free from clay, the resulting joint is apt to shrink on cooling, causing objectionable cracks. Further, the sand, if too coarse, tends to settle out of the mixture, causing trouble in pouring and shrinkage of the joint. Some very successful work, however, has been done with this material. It appears to require more care in heating than some other mixtures. The chief difficulty has been to get a satisfactory mixture, due almost entirely to the size and quality of the sand. Also, the joint is absolutely rigid, as is the case with cement mortar."

Mr. Varney reported that Brookline, Mass., in 1909 used a mixture of asphalt and sand in laying a 30-inch sewer and this gave so much better results than anything that they had tried previously that they continued to use it and up to the present time they found nothing more satisfactory, considering the ease of manipulation, cost, etc. "The method of making a joint with this material is similar to that used for lead joints, except that the material does not have to be calked. It also requires very little heat to bring the compound to the proper consistency, a small woodfire being all that is necessary. We take the precaution to fill the angle between the bell and the body of the adjacent pipe with cement mortar, but do not think that this is absolutely necessary, especially in the smaller size of pipe. We have recently inspected some of the first work done with this material and have found the joints in perfect condition, and can see no change in the consistency of the compound itself."

Mr. Brewer stated that since 1907, asphaltic compositions have been used invariably in wet places in Waltham, and thus far no failures have been discovered. "The Warren Bros. pipe jointing compound has usually been employed. A jute gasket is calked into place and the compound poured into the joint in the usual manner. In shallow trenches every third joint, and in deep trenches every other joint, is made up in the trench; the rest are poured on the bank. With the asphaltic as well as with the sulphur-sand joints, only deep and wide socket pipe was used. Both the inside of the bell and the end of the spigot should be scored by the manufacturer, else the pipes are liable to pull apart. Care must be taken to see that the compound does not break through or the gasket protrude into the sewer. The asphaltic joint has been used in Waltham on domestic sewers only, and the danger of hot water melting the compound has never arisen. Its great advantage is that it has considerable flexibility and can be used in a wet trench and without an under-drain, unless there is more ground water than can be taken care of with a trench pump operated with a gasoline engine." Mr. Brewer believes that for deep trenches a joint is desirable which will allow immediate backfilling over it. "The saving in cost effected by throwing the bottom layer of earth ahead of the pipe just laid, on top of it as backfilling, is of great importance to those who pay the bills."

David A. Hartwell, formerly chief engineer of the Fitchburg Sewage Disposal Commission, referring to

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*Continued from page 411.

DATA RELATING TO SEWER PIPE JOINTS (PREPARED BY HENRY A. VARNEY).

City or Town.	Material Used.	How Long Used.	Why Is this Material Used.	Work Done by City or Contract.	Other Material Used.	Have you Had trouble from Tree Roots?	Does Present Type Prevent Roots?	Does it Make Water-Tight Joints?	What Material Used in House Connections.	Remarks.
Boston	Cement mortar	30 yrs.	No better for all purposes	Both	None	Yes	No	No, except with extreme care	Cement mortar	Experiment under way with special material.
Brockton	Portland cement	25 yrs.	Think it the best	City	G-K compound	Yes	No	Yes	Portland cement	Iron pipe with lead joints used where roots give trouble.
Brookline	Asphaltic compound	10 yrs.	Gives best results	Contract	Cement, sulphur and sand, G-K compound	Yes	Yes	When carefully used	No regulations	House connections laid by private contractors.
Cambridge.	Cement mortar	28 yrs.	Considered practical	City	Bituminous filler	Some	Yes, if carefully made	Yes	Cement mortar	
Concord, N. H..	Cement mortar	25 yrs	Makes effective joint	City	Roman cement	Yes	Yes	Yes, when well made	Cement mortar	
Haverhill.	Cement mortar	Many yrs.	To prevent entrance ground water and tree roots	City	None	Yes	Yes, if done properly	Yes	Cement mortar	
Lawrence.	Cement mortar	Always		City	None	Yes	No	No		Combined system of drainage.
Lynn.	Cement mortar	40 yrs.	Most convenient	City	None	Yes	No	Nearly	Cement mortar	Iron pipe with lead joint used where tree roots give trouble.
Malden.	Cement mortar	26 yrs.	Considered best	Both	G-K compound	Yes	Yes, if made properly	Yes, if made properly	Cement mortar	
Melrose.	Cement and G-K compound	G-K past 2 yrs.	On account of wet trenches and tree roots	City		Yes	Yes	Yes	Any	Troubled with tree roots in house connections and some main sewers.
New Bedford...	Cement mortar	Many yrs.	For convenience and economy	City	G-K compound	No		No	Cement mortar	
Newton.	Sulphur and sand	11 yrs.	Permanent water-tight and resistant to roots	Both	Cement mortar and bituminous compound	No	Yes	Yes	Sulphur and sand	
Pawtucket.	Cement mortar	20 yrs.	Most satisfactory	Both	None	Very little	Not entirely	Not entirely	Cement mortar	Quality of work depends upon inspectors.
Worcester	Cement mortar cloth-wrapped	20 yrs.	Because it has given good results	City	None	No	Yes	Fairly	Cement mortar	
Metcalf & Eddy.	G-K compound	5 yrs	A poured joint considered best	Contract	Sulphur and sand	No	Yes	Fairly so	G-K compound	

practice in Fitchburg, stated: "Where the water plane was normally above the pipe, and where there was water in the trench, a poured joint of what is commercially known as G-K compound was used almost wholly. Other similar material was used to some extent, but G-K seemed to be more satisfactory. A round commercial gasket was used. The joint was first calked with dry jute, using no more than enough to assure a uniform annular space and to prevent the jointing material from running into the pipe. Joints were poured when the water stood as high as 6 to 8 inches above the invert, and no difficulty was found in making the joints tight enough to prevent any objectionable leakage. The G-K was melted in a gasoline kettle owing to the better control of the heat than when wood is used. It was found advisable to keep the same workman on the kettle, as there was less liability of injury to the material when a man has had some practical experience. . . . The cost of joints made with G-K compound was found to be about one-third more than cement joints, and owing to this additional cost it was decided to use this material only where there was water in the trench."

Mr. Marston said in his discussion:

Since 1913, Metcalf & Eddy have used the G-K compound, now made by the Atlas Co. of Lincoln, N. J. This material, said to be made largely of vulcanized linseed oil and clay, resembles vulcanized rubber or coal tar in appearance. It is delivered to the work as a solid, in barrels. It is easily melted by heating in an iron kettle over a fire, preferably using gasoline or kerosene, so that the heat may be controlled. Sections composed of two or three pipes may be jointed at the side of the trench, provided the pipes are set in a suitable wooden cradle to ensure true alignment. In lowering sections so made into the trench, a piece of timber should be run through the pipes in order to support their weight and prevent the joints or bells from being broken.

Asphalt has not been used, or any of the bituminous compounds, to any extent, because of the danger of hot water or steam melting out the joint due to the low melting points of most of these materials. With a sufficiently high melting point, this objection would be covered.

Some trouble has been experienced during cold weather with G-K compound, due to its failure to stick to the pipes; especially in the smaller sizes where the inside of the bell is glazed and there are no scorings. From tests made both in the laboratory and on contract and day-labor work, the results obtained with G-K compound have been satisfactory.

The cost of a jointing material and labor will be from 50 per cent to 100 per cent more with a poured joint than with cement, judging by average prices received. Part of this excess cost is doubtless due to the unfamiliarity of contractors in general with poured joints for vitrified pipes.

Good results have been obtained with a sulphur-sand mixture, with bituminous compounds such as those manufactured by Warren Bros., Boston; Pacific Flush Tank Co., New York; the Standard Paint Co., Boston, and others, and with G-K compound made by the Atlas Co.

CLEVELAND'S SEWERAGE SYSTEM.

Studies of Rainfall, House Sewage Flow and Capacities of Existing Sewers Made Basis of Design—Treatment of Sewage.

Probably the first sewer built in Cleveland was an open public sewer built 66 years ago along Spring street under the old depot which was on piles, and discharging into the lake. Few publicly built sewers, however, have been in existence more than 50 or 60 years. In the early days of the city the construction of sewers by no means kept pace with the street mileage. As in other cities, because the science and art of sewerage were in their infancy, the sewers first built were designed largely on assumption without proper basis, or adapted to existing conditions only, without regard to future changes and growth. The development of the Cleveland system was described in a paper before the Cleveland Engineering Society by Robert Hoffmann, commissioner of engineering of that city, from which paper the information in this article is drawn.

Study and observations relating to frequency and intensity of rain storms continued over a period of some fifteen or twenty years furnished the first reliable data for designing storm sewers. Studies also were made to determine the proportion of the rainfall that reached and was carried off by the sewers and the rate at which this took place. Further observations were made to determine the rate and fluctuations in flow of house sewage. The carrying capacities of existing sewers of various sizes and different materials were studied also.

For the most part, the sewers of Cleveland are on the combined system, although in a few suburban sections separate sewers have been provided for house sewage and for storm water. The ultimate outlet for all the sewers—separate, storm and combined—is in Lake Erie. To avoid building large, expensive sewers all the way to the lake shore, use was made of the various creeks and rivers that flow into the lake for sewer outlet purposes. In order that these streams might not be unduly contaminated with sewage, the dry-weather flow is not discharged into streams, but what water enters them leaves the sewers at overflows, from which it is led by storm water outlets to the streams. The dry-weather flow, and such flow diluted with a certain amount of storm water, is conducted past the overflows through a system of intercepting sewers which ultimately carries it to treatment plants in order that the pollution of the lake which the sewage would cause may be very greatly reduced.

Probably almost all materials used in sewer construction have been employed to some extent in the Cleveland system. Masonry and vitrified clay pipe have been employed to a greater extent than other materials, how-

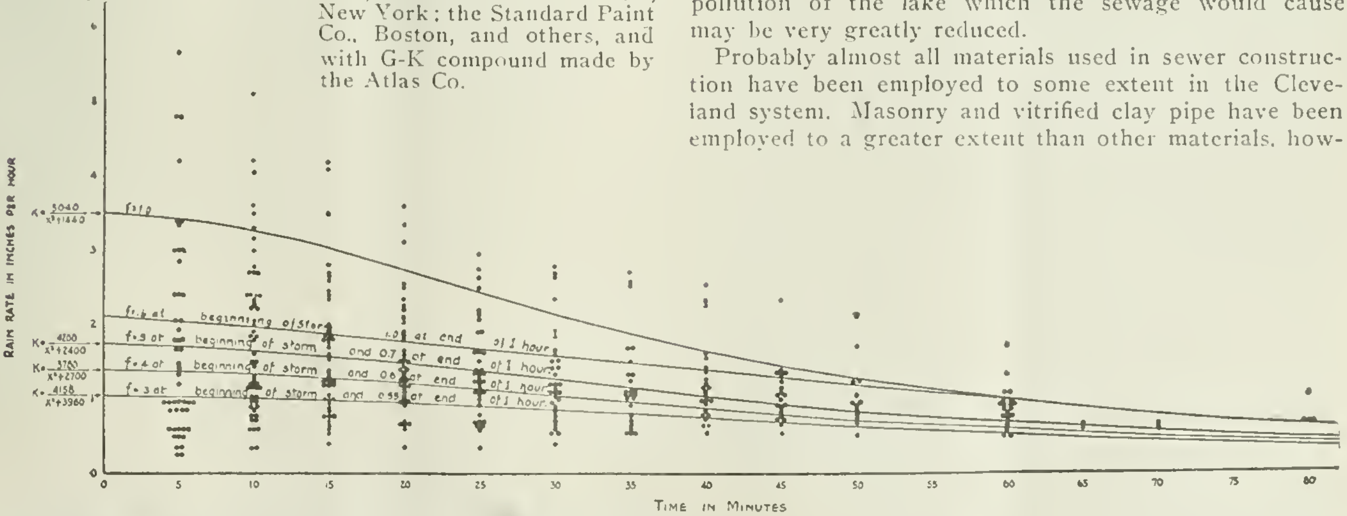


DIAGRAM OF RAINFALL CURVES AND SHOWING RATE OF RAINFALL FOR ALL STORMS AT CLEVELAND FROM 1890 TO 1907.

K represents rate of run-off in cubic feet per second per acre; X represents time in minutes; f represents degree of imperviousness of surface. The second curve from the top is the one commonly used.

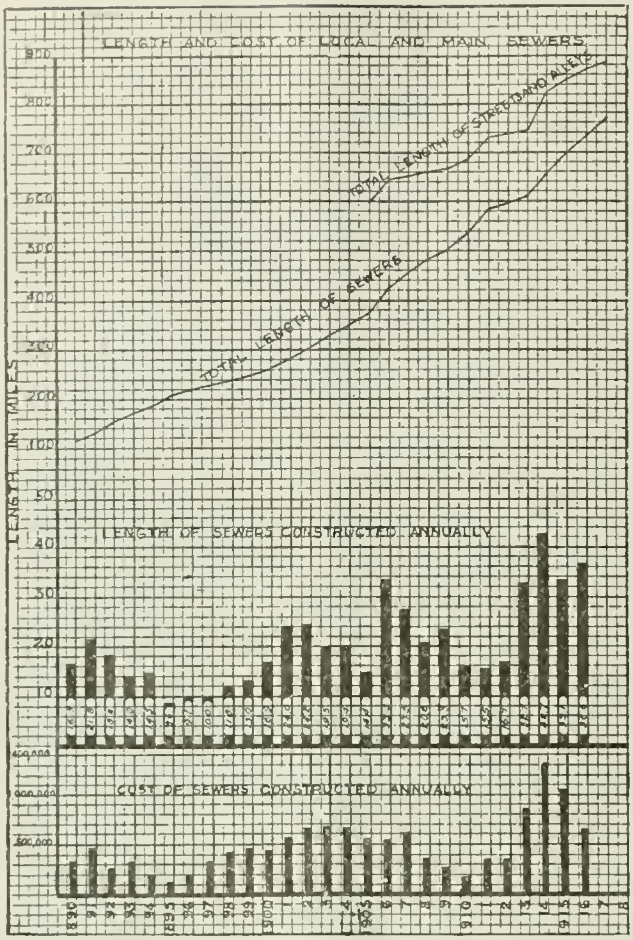


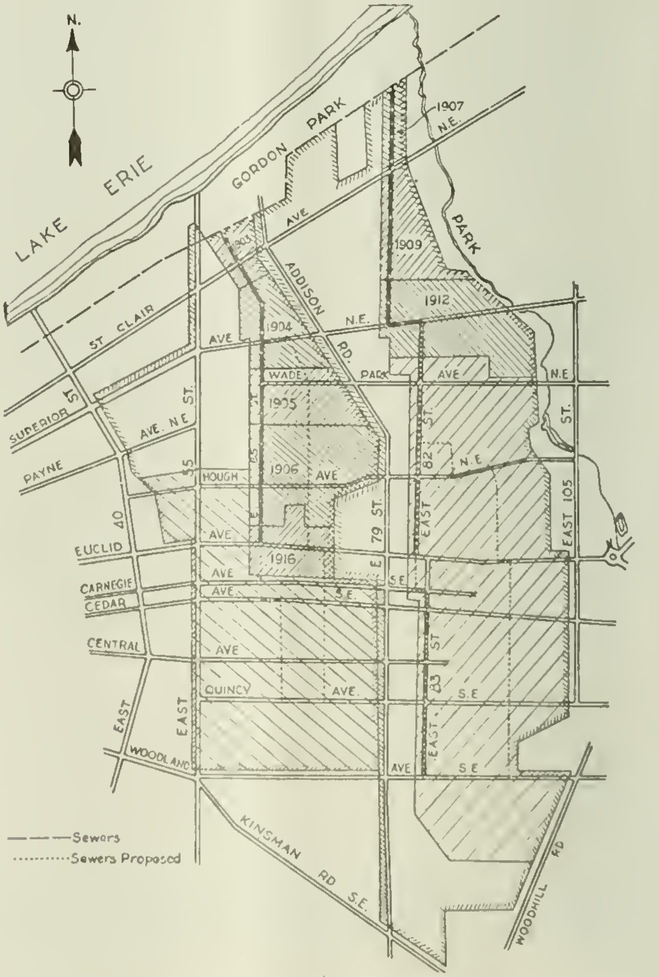
DIAGRAM SHOWING PROGRESS IN SEWER CONSTRUCTION AND RELATION BETWEEN STREET MILEAGE AND SEWER MILEAGE.

ever. Concrete has been used largely for foundations and to some extent in reinforced monolithic constructions for sewer arches. A few sections of sewer have been built of concrete block and a few sewers have also been built of segmental blocks of clay.

In order to accumulate as complete a collection of data as possible for designing storm water sewers, rainfall observations have been taken over a long series of years. These have been plotted and a rainfall curve evolved which is now generally used in the designing of sewers for the city. This curve makes due allowance for the varying intensities of rainfall as a factor of the time element and also takes into account the probable proportion of the rainfall that may reach the sewers as affected by the imperviousness of the soil. Mr. Hoffmann said that the experience in Cleveland seems to show that few sewerage systems capable of discharging a cubic foot of flow per second per acre of drainage area cause much trouble by reason of the sewers being overtaxed and a consequent flooding of basements along their routes.* However, he does not believe that this would be a safe basis to assume in territories all paved and built up so that a large proportion of same are under roof, but a more liberal assumption must be made in such cases. The capacity named, however, answers very well in residential districts and has been employed where existing systems are being studied with the object in view of rebuilding those found of insufficient capacity.

For the dry weather or house sewage flow the calculation has been based upon an average flow of 100 gallons per capita per day, with a maximum of 400 gallons for short periods of time, which also allows for some infiltration of ground water and a certain amount of rain water. The overflows are so designed that no sewage will overflow through the storm outlets until the house sewage is diluted with from three to five parts of storm water.

The quantity of house sewage is increasing with the growth in population and is becoming something of a menace to the water supply and a nuisance to occupants of lands along the lake front in and near the city. This was recognized some years ago, and studies were begun to determine the quantity of sewage and the best method of treating it. These studies have been practically completed and tentative plans made for sewage disposal so that now the department having this work in charge is ready to proceed with the construction work; in fact, considerable progress has been made. The general plans contemplate three sewage disposal plants, one known as the easterly plant, located on the shore of the lake at East 140th street; the southerly plant located on the Cuyahoga river, and a third on the lake shore at the westerly end of West 58th street. Each of these will treat the sewage from one of three drainage districts into which the city is divided. The land required for all of them has been secured and part of the work of construction completed. As the exact method of treatment has not been fully approved, only such portion of the work has been placed under construction as could be used to advantage in whatever method of final treatment



CONSTRUCTION OF RELIEF SEWERS.

Shaded areas represent territory the E. 65th street and E. 82nd street sewers are supposed to drain ultimately, thereby relieving sewers in E. 55th and E. 79th streets, now severely overtaxed. The amount constructed each year and territories drained are indicated on the map.

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*This is not a safe rule for many cities, however— Editor.

might be adopted. This consists principally of preparation of the site, excavation work and outlet conduits.

Mr. Hoffmann described at some length the legislative procedure necessary preparatory to constructing a sewer and also the method of paying for the sewers. The former, as is the case in many large cities, is somewhat complicated and requires that legislation for a sewer must be started before June 1st of a given year if the sewer is to be constructed during the following year. The city assesses a part of the cost against the property and pays the balance by issuing bonds. The assessment is theoretically based upon the benefit accruing to the land by reason of the sewer construction; but in practice it is assumed that such benefits are in proportion to the frontage of the property along the sewer. The city therefore assesses so much a front foot, but charges all property an amount that is estimated to be the cost of a local sewer under average conditions. For many years the assessment was $2.00 a foot, but recently has been increased to $2.50 a foot.

Although the city bonds pay a considerable part of the cost of sewers, Mr. Hoffmann does not think that the construction of sewers should be considered as causing an indebtedness. In a modern city, property without sewer facilities is undesirable and not in demand, and therefore has less value than land located where sewerage is provided. This means, in the first place, that the land cannot be used to its best advantage; next, that the city does not get the benefit of taxes assessed upon the increased value that the sewer would give to property nor upon buildings that probably would not be constructed until sewers were available. It would seem, therefore, that a sewer is a distinct asset to a city, adding to its value and increasing its income.

AMERICAN WATER WORKS ASSOCIATION CONVENTION

Description of the Thirty-eighth Annual Convention which Met Last Week at St. Louis, Missouri—Changes in the Constitution Giving Closer Union between Active and Associate Members—Committee Reports.

Reported by CHARLES CARROLL BROWN.

To an old member of the Association, who has not been present at a convention for several years, for the first two days it had the appearance of a school with Johnson acting rather as the principal, and with Fuller and Metcalf as the instructors or lecturers, and Chester as a sort of adjunct professor, presenting what he considered important among the omissions of the others. The rest of us sat and listened, asking occasional questions when we wanted more detail or light on some point not touched upon.

And the school was a very good one, the instructors of the best in both matter and manner, and the agreement almost perfect. Only Mr. Chester had any tendency toward variation from strict orthodoxy, and he was correspondingly refreshing, like a bit of spicy flavoring after a rather heavy and ordinary piece de resistance of a first-class banquet.

After the opening ceremonies of the Institute on Monday evening and the report of the executive committee on Tuesday morning, instruction began under Principal Geo. A. Johnson, who presented the report of his committee on revision of the constitution. This report, which, with full explanation of the proposed changes, was printed and in the hands of the members, was so satisfactory that the changes were adopted unanimously and practically without discussion.

The Association is evidently well satisfied with its present close connection with the manufacturing interests in the water works field, and makes it still closer by admitting to active membership the technical experts employed by associate members. From the point of view of their value to the society as such technical experts, this is merely a recognition of such value and is beyond criticism if such members act as independent individuals.

The controversy of recent years over the selection of candidates for office has been settled with apparent satisfaction by following the general principle adopted by the American Society of Civil Engineers, though the details differ in the interest of simplicity and economy. Twelve trustees selected from six districts insure distribution of the majority of the membership of the executive committee over the country, it being the intention to change the boundaries of districts from time to time so as to keep the number of active members in the districts as nearly equal as possible. At present this puts eight of the twelve trustees in the area east of the Mississippi and north of the Ohio, unless District No. 1 should have a trustee from western Canada. The officers, including the trustees, are to be nominated by a committee selected, one from each district, by the members residing in the district, the method of insuring the representation of every member in the vote, if he desires, being as simple and inexpensive as possible. If the members do not secure the representation they desire in the official family it will be very largely their own fault.

A convention committee is provided in one amendment, whose function is to inform itself concerning facilities of applicants for the conventions and report before the vote is taken by the convention, and also to visit the city and ascertain its capabilities before finally making the decision. Since the Water Works Manufacturers' Association has charge of the exhibits and of the entertainment features of the conventions, and this association is made up of associate members of the A. W. W. A., co-operation of convention committees of the two associations is provided for and associate members vote in the selection of the place of meeting, this provision of the constitution not being changed. Custom is hard to change, and the writer has not attended conventions recently, but the character of some of the entertainments offered at St. Louis was such as to make it incumbent on the Association to assume some control over them. It was said to be the first of the kind given this Association, and we are told not to look a gift horse in the mouth, but in these days when teeth are accused of being the source of most of the ills that flesh is heir to, this injunction may well be relegated to the waste basket.

The last amendment classified the situation regarding the financial relations of the Association with its local sections.

Mr. Johnson then gave the report of the committee on publications, which was organized late in the year to consider ways and means of increasing the value to the members of the Association's publications. It recommended that committees on progress in various lines be provided who should make frequent reports directly to the publication committee as well as to the convention at its annual meetings, the co-operation of the members being depended upon to give the desired freshness and completeness to the monthly publication. If necessary, the papers presented before the convention should be edited to cut out the repetitions unavoidable in a number of papers on the same subject, and to eliminate material of purely local interest. While the report of the committee does not recognize the difficulties in the way, on the one hand of getting the material desired, and on the other of getting rid of the material not wanted, it is in the right line and indicates a general procedure which should greatly benefit the membership, if it is intrusted to a competent editor.

The report of the committee on revision of standard specifications for cast iron pipe and specials was moved up from Friday to Wednesday morning and presented by Walter Wood, a member of the committee. It gave the results of a questionnaire replied to by about 50 cities in the A. W. W. A., and about 100 in the N. E. W. W. A, showing that nearly three out of four thought revision desirable; about the same proportion desired uniform outside diameter, and still larger percentages desired revision in other particulars. After some discussion in which it was made clear that the changes could not be further formulated until the committee had further authority from the Association, and that no changes would be put into effect until after the war, the desired authority was given. Mr. R. D. Wood stated for the manufacturers that what is needed is an international specification, especially as to chemical constitution of iron, or at least one which will open the markets of the world to American manufacturers in competition with the other large manufacturing nations.

Mr. Johnson presented at the Tuesday evening session the resolutions proposed by a special committee regarding treatment of water supply questions during war times. A most convincing statement was made of the necessity for priority in permission to purchase and transport a list of materials essential in the operation of water plants, particularly their purification departments, and drafts of letters to Director McAdoo and others were offered for approval and at once adopted.

The second question considered by the committee was that of increase in rates on account of war conditions, and issue of bonds for necessary construction. Each company or department has its own problem and, to secure equitable treatment from the authorities controlling rates, the operators must show what their actual conditions are and what must be done to improve them so that the plants can live. What must be done in this line depends also very largely upon the statutes and the bodies controlling rates, whether state or local, boards or councils. The report and Mr. Chester in discussion laid emphasis on the necessity of making all the savings possible, the authorities always being more ready to come to the aid of those organizations which are doing all they can to meet the situations before them. Mr. Metcalf called attention to the fact that wage increases in water works organizations had not been as great as in other employment, but would follow soon, and this prospect must not be overlooked in estimating the future cost of operation. In these requests for increases in rates, questions of valuations of plants, and particularly of increases in valuation, should be omitted from consideration. Efficient men are hard to find to fill vacancies, and those now engaged should be retained at any reasonable increase in wages. If they are not, their places must be filled with less efficient men and probably at equal or higher wages, with consequent increase in cost and decrease in efficiency.

In these days of conservation it can with propriety be suggested that to most of the members a reduction in the time devoted to the convention and, consequently, in the money spent in attending it, as well as in providing the entertainments, would have been quite endurable if not really preferred. It might have increased the total attendance and would have kept the attendance together better for the full time of the convention. The total registration, including guests, was nearly 500, that from out of town somewhat less than 400, active members leading with 180 in attendance.

The slate presented by the nominating committee was accepted and the officers elected were:

Charles R. Henderson, Davenport, Ia., president; Carleton E. Davis, Philadelphia, vice-president; Allan W. Cuddeback, Paterson, N. J., and J. J. Hinman, Iowa City, Ia., trustees. The convention will meet next year in Buffalo, N. Y.

PAPERS AT THE CONVENTION.

The papers listed on the program were presented according to schedule except two whose authors were absent and the four on special features of the St. Louis water works which were side-tracked by the special orders of discussion of committee reports and the late beginning of the session of Wednesday morning. They will be published and will supplement and explain the observations on the inspection trip to the Chain of Rocks station Wednesday afternoon and the excellent statement of the plan of operation distributed to the members.

G. W. Fuller's lecture on "Emergency Construction Due to War Conditions" was on the lines of his recent address to the American Society of Civil Engineers and he used the same illustrations. This was a very interesting presentation of the data available regarding the matter in the various government offices, which were gathered and put in their proper relations to make a complete story, embellished by some details available only to one rather closely connected with the work; Mr. Fuller and Mr. Metcalf being members of the civilian committee having supervision over the sanitary features of the camp and cantonment construction. The differences between regular and emergency work were emphasized and the reasons for differences between estimates and costs and for excessive cost were given. The really wonderful results attained were praised and the advantages to the work of the cutting of departmental red tape by the civilian committees acting in advance of appropriations or authorizations were clearly shown. The good team play of these committees was responsible for their success, in the opinion of Mr. Metcalf.

While E. R. Conant's paper on the Savannah artesian water supply was largely local on account of the peculiarities of the local conditions, it contained much of general application. One point brought out and emphasized by questions in the discussion was the effect of increase in pressure upon increase in consumption. Thus an increase in pressure from 75 to 115 lb. increased the rate of pumping from 4,000,000 to 7,000,000 gallons a day, or in other words 52 per cent increase in pressure corresponded to 75 per cent increase in water pumped. Some of this increase in flow is due to increase in waste and leakage on account of higher pressure. In the effort to conserve the supply and reduce the cost of pumping, the pressure is reduced when consumption is low, as at night, when low pressure will cause the least inconvenience and will reduce useless flow from wasting fixtures and leaks to a minimum.

(*To be continued*)

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FILL THE RED CROSS RESERVOIR.

There is now in operation the largest water works system with the longest aqueduct the world has ever known. It is a dual system, there being two distribution systems, a double aqueduct three thousand miles long, and two impounding reservoirs.

The larger of the supplies is a high-pressure service used for extinguishing a fire that has broken out in central Europe and is threatening the world. It is also to be used for flushing out the Hun sewers, in which is dammed up a pestilential filth that, if released, will bring disease and death to liberty in every country. The firemen are going over by the tens of thousands every week, the hose is laid (some lines are already in service), and the larger reservoir has received from a recent shower more than three thousand million gallons.

The fire-fighters' work will be strenuous and their thirst will demand refreshing and heartening draughts of pure water. Also residents of the countries already overswept by the fire need such water—their parched lips plead for it and their own wells have been well-nigh drained by the long, exhausting draught upon them. Here in America is the most abundant supply available of pure Liberty spring water, issuing from millions of springs throughout the land. From these this second supply must come. Their contributions will be collected in Red Cross reservoir. That reservoir needs now one hundred million gallons at least. If more flows into it, flash-boards will be set on the spillway and all will be impounded.

I and you, every one of us, are the springs, and we must fill that reservoir and keep it full. If leaves of indifference choke our outlets, clear them away. Let's make them put on flash-boards to the limit!

FILL THE RED CROSS RESERVOIR!

ELECTRIC THAWING OF SERVICES.

An interesting question of policy is raised by Superintendent McReynolds in the article in this issue describing thawing services and hydrants at Colorado Springs. Should a water department or company thaw services by electricity or other method that does not require digging them up, or encourage consumers to do so? Mr. McReynolds thinks not.

His reason is easily understood. A service that freezes once is likely to freeze again unless conditions change. This is evident to any consumer. The changes in condition that will prevent freezing are generally confined to two—giving more cover to the pipe so as to get it below the frost line, and keeping the water running. The latter is the cheaper and easier to apply and is the one that the consumer is most apt to employ, especially if on a flat rate. But it is one that all superintendents wish to discourage unless the supply is unlimited and by gravity, and the mains are abundantly large to permit this without objectionably reducing the pressure and the amount of water available for fire. Such supplies and distribution systems are comparatively few.

This being the case, he would discourage the adoption of this alternative by encouraging or requiring the other. If a trench has been dug down to the service to thaw it out, there is comparatively little more work or expense involved in making the trench deeper and lowering the pipe. If it be lowered enough, the danger of freezing is removed for all time; for a pipe never freezes if the ground around it is not below freezing temperature. On the other hand, if a consumer can have his service thawed out at any time in a few minutes by electricity, and be fairly safe against freezing by letting water run all winter at no expense to himself, it will be difficult to persuade him to go to the expense of lowering his service pipe.

The matter is certainly worth serious consideration. Incidentally, it suggests that every water works' management in northern cities might require all services to be placed below danger of freezing. If any service not so placed should freeze, then, even though it be thawed by electricity, the water could be shut off from this service and kept off until the service had been lowered.

OIL AND TAR PRODUCTS AVAILABLE.

Information has been given out within the past few days by the Office of Public Roads and the Fuel Administration that petroleum, asphalt, or tar products wanted for the construction, maintenance, or reconstruction of roads will in future be delivered only after approval of the application by a committee representing the United States Fuel Administration and the Office of Public Roads of the Department of Agriculture. Notice to this effect has been sent to all state highway departments and these will be required to pass upon all applications for highway work in their territories in which the use of these materials would be required. The highway department will then forward applications approved by it to L. W. Page, director of the Office of Public Roads, who is chairman of the committee that will consider the necessity that material of this kind be supplied and which in turn will make recommendations to the Fuel Administration, by which will be issued permits in accordance with these recommendations if the material is available.

It is estimated by the Office of Public Roads that more than a billion dollars worth of bituminous macadam roads in this country required asphalt, road binders, road oils, tar binders or dressings for their maintenance. It will be the aim in issuing these permits to prevent deterioration of these roads and at the same time to satisfy fully the fuel oil requirements of the army and navy, the essential war industries, and the Allies.

The United States is now being drawn upon to a constantly increasing extent for petroleum products, especially fuel oil, according to officials in the Oil Division of the Fuel Administration. The supply of bituminous products is so limited that it is requested that all new road construction involving these materials be deferred this year, except in cases where such work is necessary toward the winning of the war. Preference will be given to materials wanted for maintenance and repair work.

Forms on which all applications for petroleum, asphalt, or tar products for highway work must be made have been supplied to the state highway departments and additional copies may be obtained from the Office of Public Roads. These forms require detailed information as to the length, location, general uses and military necessity of highways to be built, maintained, or repaired.

TAR FOR BRIDGE FLOORS.

The use of tar for treating worn plank bridge floors was tried last year by G. F. Barstow at Stillwater, Minnesota, and J. T. Ellison, chief bridge engineer of the Minnesota Highway Department, has stated that the department is planning to adopt the plan this year for a number of timber and concrete bridge floors. This statement was made, and a description of the use at Stillwater was given by Mr. Barstow, at a meeting of the Minnesota Surveyors' and Engineers' Society a few weeks ago. The description given was as follows:

In the spring of 1917 it was necessary to replank the bridge across the St. Croix river at Stillwater, as the old planks had worn down very rough and in a great many places they were worn down as much as two inches. I figured that it would cost thirty-five hundred dollars to replank the bridge, which is seventeen hundred feet long. The planks will last from five to six years. The present planks were put on in the winter of 1910. I also figured on a creosoted block floor, but that would cost more than the city council wanted to put into it, as the bridge is a wooden structure and will very likely have to be rebuilt before many years.

While talking to the representative of the Barrett Co., he suggested that I surface the bridge with tar and gravel and explained to me the method and cost of doing so. After giving it considerable study I decided to try the experiment. The work was done in the following manner:

First we went over the bridge and filled in all the large cracks between the planks with lath and toe-nailed them to the planks, at the same time spiking down all loose planks. Then we took a small gasoline fire engine belonging to the city down to the bank of the river, pumped water and washed the floor of the bridge with the fire hose. As soon as the bridge was dry we went over it and gave it a priming coat of Tarvia B, which penetrated into the planks about one-half an inch. As soon as the Tarvia B was all absorbed by the planks, we give it a coat of Tarvia A heated to 125 degrees F. and immediately covered this with gravel which had been run through a one-inch screen. The gravel covering was done in the same manner as on the streets except that we had to pile at the ends of the bridge and haul it onto the bridge and spread it with shovels from a wagon.

As soon as the gravel had been spread, the bridge was opened to traffic and after about ten days the second coat was applied in the same manner. In another ten days we applied a third coat and this completed the job. Nearly all of the unevenness of the planks was taken out and now we have a fairly smooth floor and there is no wear at all on the planks. I examined the bridge during the warm weather this month (February), when there was no snow on it and found the coating as good as it was last fall, not any of it having scaled off.

I intend to give the bridge one more coat this summer and expect to take all of the unevenness out of it. On this summer's work on the bridge I will cover the tar with crushed rock chips that have been run through a half-inch screen and have also had all of the dust screened out of them. This rock is crushed nigger-heads that was screened out of our gravel pit.

The entire job cost five hundred and sixteen dollars and eighty-nine cents, or about nineteen cents per square yard. I figure that, if we give it one coat every year to keep it up, it will cost less than half as much as replanking every five or six years and we will always have a good, smooth floor on the bridge. The planks are also well protected from the moisture and will last for a good many years before they decay.

WOOD BLOCK BRIDGE FLOORS.

In a paper under the title of "New Features in Brick, Wood Block and Stone Block Pavements," Clifford Older, state highway engineer of Illinois, gave before the American Road Builders' Association the following experiences in the use of creosoted wood blocks for bridge floors:

Having had some experience with creosoted block floors on highway bridges, a few points learned by experience may be of some interest. In such construction it is of prime importance that the foundation, or sub-floor on which the blocks are laid, be sufficiently rigid so that, acting in conjunction with the cushion, it will not deflect enough to leave the blocks poorly supported. Otherwise the blocks will split under the traffic. As slight deflections of the sub-floor are inevitable, a somewhat plastic cushion should be interposed between the blocks and the sub-floor in order that the bearing of the blocks may become adjusted to the deflection of the sub-floor under the average traffic. The greater the live load deflection of the sub-floor, the greater becomes the need of plasticity in the cushion.

In the practice of the Illinois Highway Department, a sub-floor of creosoted plank 3 inches thick is laid on stringers spaced from 2 to 2½ foot centers. This is mopped with bituminous material and covered with a ¼-inch layer of bituminous felt. The felt is then coated with bituminous material and the blocks immediately laid. One-eighth-inch joints are provided as well as a one-inch expansion joint along the curb. A plain sand cushion should be avoided, as the vibration of the bridge is sure to cause it to shift. A cushion of bituminous material and sand would probable be satisfactory, if laid with proper care, but this expedient has not been tried by the writer.

The WEEK'S NEWS

State Highway Developments in Idaho and Michigan—Indiana's Highway Law Declared Invalid—U. S. Public Health Service Inspects Schools—New Water Mains for Washington—Pasadena Leases Power System—Big Munitions Explosion Near Pittsburgh—Capital Issues Committee Begins Operations—City Manager Plan for Roanoke—Six-Cent Fares for St. Louis—U. S. Shipping Board Investigates Transportation—War Department to Build $40,000,000 Supply Base in Brooklyn.

ROADS AND PAVEMENTS

State Funds May Not Be Invested in District Bonds.

Boise, Ida.—Interest money derived from the state's endowment funds cannot be invested in highway district bonds, according to the attorney general's office in an opinion written for the state land board. It is provided in the constitution that the educational funds may be invested in mortgages on improved farm property in the state, state, federal and school district bonds and in state warrants. At the twelfth session of the legislature the law was amended and the land board was authorized to buy highway district bonds. "It is our view that the constitutional enumeration of securities is exclusive," said the attorney general, "and that the legislature is powerless to add to or subtract therefrom, but that a constitutional amendment is necessary to warrant investment of the educational trust funds in highway district bonds." The attorney general said he did not question the advisability of investing the educational funds in the highway bonds if the law would permit. Two highway districts in Idaho county had expected to sell bonds to the state, but the attorney general's ruling will force them to seek a new market.

State Highway Law Declared Invalid.

Indianapolis, Ind.—Indiana's state highway commission law, passed at the last session of the legislature, and which was regarded as one of the most important measures enacted, has been declared unconstitutional by judge Cloe, of the Hamilton county circuit court at Noblesville. The action was taken in overruling a demurrer filed by the state against a suit questioning the validity of the act, which was filed by Robert House, a wealthy farmer living in that county. The defendants in the proceedings were L. H. Wright, chairman of the state highway commission, and its other members, together with Otto L. Klauss, state auditor. While the case can now go to trial on its merits, it is understood that this course will not be followed by the state, since the ruling of judge Cloe on the demurrer indicates what his final decision would be. Instead, it is expected that the defendants will appeal at once to the state supreme court. The ruling has attracted attention all over the state, because it has a direct bearing on all of the state roads which the commission has planned to build during the next two or three years. It is thought that nothing will be done on these state highways in the face of this ruling, until there is a decision from the higher court. Judge Cloe said in part: "The power to tax is within the grant of the legislative authority, and there can be no delegation of that authority, except to the extent of which it is necessary that taxes shall be levied under legislative authority by the various municipal bodies within the state for the purpose of carrying out the ends for which such municipalities are organized; and the power of the legislature in matters of taxation is unlimited, except as restricted by the constitution; and the legislature, in the exercise of its power in making local improvements, may create a special taxing district without regard to the boundaries of counties, townships or municipalities. Under the law in question, it is contended by the plaintiff that the state legislature has no power to create a taxing district, as contemplated by said law; that the district should be all the counties through which said proposed main market highways have been designated, and that all of said counties should constitute the taxing district, and should not be subdivided into a lesser unit, that is, each county within itself.

> "The supreme court of Indiana has held, at different times, that the state legislature had the power, and in the enactment of certain laws, to grant and fix certain territory or territories as a taxing district for the making of public improvements or local improvements. Board of Commissioners of Monroe County vs. Harrell, 147 Indiana, 500.
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> "Again, it is earnestly contended by plaintiff that the commission highway law provides for special assessment to raise funds for the construction of highways, and it is equally contended by the attorney-general, in support of his demurrer, that the tax levied by the state and by the various counties, through their proper officers, is not an assessment for benefit of property, or a special assessment, but is a general tax.
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> "A special tax is a tax levied by the taxing authority for a special purpose, and, as stated by the attorney-general in his brief, a taxpayer can demand only two things: First, that it be expended for a public purpose; second, that it be of some benefit to him. There is a difference between general taxation and assessment. An assessment, as held by the various courts, is a tax levied upon abutting property owners in proportion to the benefits derived from the improvement.
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> "I think, in accordance with the opinions of the judges of the various courts in the decisions that have been cited, that no question can arise but what the improvement of public highways is of some benefit to the taxpayer of the taxing district. The question goes to the taxpayer, to what extent is his property benefited, and whether or not he is entitled to say or have a notice thereof.

"There are numerous decisions in the United States courts upholding the right to create taxing districts for public drains and for public highways, but in each case cited in the United States supreme court, provision was made for hearing and notices to the various property owners within said taxing district, and especially was it true in the case of Embree vs. Kansas City Road district, 240 United States reports 242. In view of the decisions referred to, and the numerous ones cited and read, the court is of the opinion that some notice is necessary to the taxpayer, and that some limitation of the amount of indebtedness or tax levy to be made should be stated."

Plan Convict-Built Concrete Road.

Lansing, Mich.—If the next legislature will approve a plan outlined by the Michigan Penology commission at a recent conference held in Grand Rapids, a concrete highway extending from Grand Haven to Detroit will be constructed within the next two years. By employing convicts from Ionia reformatory, Jackson prison and the Detroit house of correction, it is claimed by state highway commissioner Frank Rogers that the cost of construction of an 18-foot concrete road could be reduced to $25,000 per mile. Warden Otis Fuller, head of the Ionia reformatory, who has had recent experience in utilizing convict labor on highway construction, believes that the state highway commissioner's estimate is too high, and he declares that in spite of the increased cost of materials the cost per mile should not exceed $18,000. From Detroit to Ypsilanti, concrete has already replaced gravel with the exception of a few miles. It is proposed to extend the concrete highway from Ypsilanti through Jackson, Lansing, Ionia and Grand Rapids to Grand Haven. Seventy trusties from Ionia can be spared from the prison farm and the other industries and will be available for road work if the legislature will provide the funds to meet the amounts which will be raised by the various counties through which the proposed concrete trunk line will pass. Acting warden Frensdorf believes the members of the board of control of Jackson prison will look with favor on the proposition, and he estimates that at least 150 men could be spared from his institution for this important work.

SEWERAGE AND SANITATION

Bureau of Health Instruction Discontinued.

Toledo, O.—The city's Bureau of Public Health Instruction has been discontinued on the recommendation of the commissioner of health. The bureau was provided for in the ordinance passed by council in March, 1917. It was not actually established until May 15, when Joseph Kelsey was appointed director of the bureau in the recommendation of health commissioner Selby, by the board of directors of Toledo University. The university has financed the bureau since that time. Commissioner Waggoner's reasons for suggesting the abandonment of the bureau were that he could not make sufficient use of it to justify the employment of a full-time man. While he intends to use publicity to educate the public on health measures, he proposes to direct this work personally. Regular health bulletins, to occupy a specified place in the City Journal, are under consideration as a part of this plan.

Sewerage Improvements in Pennsylvania Towns.

Harrisburg, Pa.—The state department of health, during the month of April, issued the following permits and decrees for improvements to sewerage systems: Eldred, approving plans for a comprehensive sanitary sewer system and requiring detailed plans for sewage treatment works; Penn, approving plans for a comprehensive sanitary sewer system and sewage treatment works; Vandergrift, approving plans for an outfall sewer, sewage pumping stations and sewage treatment works; Throop, approving revised plans for a comprehensive sanitary sewer system.

School Inspection by U. S. Public Health Service.

Washington, D. C.—Medical inspection of school children is one of the activities now undertaken by the United States public health service to prevent the carrying of communicable diseases to the troops. Such inspection has already been commenced in practically all of the zones surrounding the army cantonments. An officer of the service is detailed to give his full time to the work and has an office and the assistance of school nurses or other help. The expenses, as a rule, are met jointly by the Red Cross, the local health authorities, and the public health service. Regular inspection of the work is carried on by a service expert familiar with the best standards of school hygiene. In but few of the places where this work has been commenced had school inspection been previously practiced and in none had the full-time services of a physician been devoted to it. Now, with a skilled officer giving his full time to the work in each locality, much is expected to be accomplished. In communities where school inspection has been adequately carried out, the result has been a remarkable reduction in the incidence of contagious diseases in the general population. The same result is expected in the areas around the cantonments. The plant is for the service office and nurse, through cooperation with the teachers, to keep a close watch on each school for the early detection of contagious diseases. The parents are then notified, the quarantine rules are enforced, vaccination is practiced where it fits the case, and all possible is done to prevent the disease from reaching the cantonment. The protection of the troops is the great aim; but at the same time the other benefits to be derived from school inspection are not overloked. Thus, while all of the children in the areas around the cantonments are examined frequently for communicable disease, they are also to be examined at least once a year for physical defects. These defects tend to lower individual resistance and increase the susceptibility of a child to contagious diseases. They also retard intellectual development and prepare the way for degenerative diseases in later life. When the defects are found the parents are informed and urged to have them corrected. The great number debarred from the army and navy recently because of physical disability indicates that many such defects, which could have been corrected in childhood had they been known, remained uncorrected, with a resulting loss in national efficiency at this crucial moment. In the examinations every effort is made to consider the parents' wishes in regard to inspection of their children. Where a doctor's certificate is presented, the child may be excused from the physical examination. The nurses not only assist in making the examinations, but go to the homes, follow up cases of communicable disease, tell the parents how to prevent the spread of the infection, look up children reported as absent to see if they are sick, and give advice in regard to personal hygiene. Clinics are established wherever possible, in order to give the necessary operative treatment to needy children. Where such clinics are not feasible, an effort is made to arrange with local physicians for the treatment of such cases. An attempt is also made to determine cases of defective or retarded children, so that they may be given special instruction fitted to make them useful citizens. Encouragement is also given to the teaching of personal hygiene in the schools. Furthermore, the sanitary conditions of the schools themselves are looked into, and the school authorities are given advice as to improvements in toilet arrangements, heating, ventilation, humidity, illumination, size of desks, playgrounds, etc. These features, and in fact all of the work, are conducted with a view to interesting nearby localities in school inspection. It is recognized that to effect any great improvement in the sanitary conditions of the country it is necessary to educate the school children in regard to the principles underlying public health.

WATER SUPPLY

Leak Survey Saves Pumpage and Coal.

Buffalo, N. Y.—Water commissioner George C. Andrews has reported to commissioner Kreinheder of the department of public works that during April water pumpage was reduced millions of gallons with a saving of 415 tons of coal, which means an economy of $1,850. The pitometer experts have been at work searching for underground leaks which do not show on the surface of the streets and have found in Wyoming avenue leaks which discharge 265,000 gallons of water every 24 hours into a sewer. Two broken curb cocks and a faulty hydrant which had been covered over in repaving caused those leaks. They have been repaired.

Water Shortage When Landslide Breaks Main.

Sheridan, Wyo.—This city faced a serious water famine when the greater supply of the city was cut off by a break in the main inlet pipe caused by a landslide. All four of the big reservoirs from which the water supply is drawn were absolutely empty and in many homes not a drop of water could be secured. Except for the chemical in case of fire, the department was absolutely helpless, as a pressure of from 60 to 80 pounds is necessary for working the hose effectively and only 15 pounds was registered at the station. The landslide occurred on the hillside of Rapid creek and the pipe broken was a 12-inch line that supplies the new reservoir southwest of the city. As soon as the break was reported a big gang of workmen was hurried to the trouble, the valve at the head of this line was shut off and the work of making repairs at once began. All the water that reached the city came through the old 8-inch pipe line that leads to the reservoirs northwest of town and the overflow from the fort line.

Rush Work on Water Mains in Capital.

Washington, D. C.—President Wilson recently issued an executive order declaring the construction of water mains on a number of streets in the city to be an emergency and waiving the eight-hour work law on the jobs. Congress at the end of last March passed an urgent deficiency bill providing $70,000 for 24-inch mains on a number of streets, and $66,700 for 12, 16, 20 and 24-inch mains on others. According to the President's order, "these water mains are to be constructed for the convenience of office buildings erected by the United States government in this vicinity in connection with work relating to the present war, and the commissioners of the District of Columbia have requested that this be declared an emergency matter, and have asked that the eight-hour law relating to the employment of laborers and mechanics in the District of Columbia be waived in connection with the construction of these water mains." Pay will be allowed to those entitled in the construction of the mains with compensation of time and a half for overtime work.

STREET LIGHTING AND POWER

Commission Refuses Surcharge.

South Bend, Ind.—The Indiana and Michigan Electric Company of South Bend will not be permitted by the state public service commission to add a surcharge to its electric rates in South Bend, Mishawaka, Elkhart, Lakeville, Osceola, Rolling Prairie and other northern Indiana towns. The commission found that the company is making 8 per cent on its value and that no surcharge petition was justified. It found also that the company supplies current "at less than cost" to large consumers and that therefore the small or average consumer has to contribute just so much more to pay the big consumer's bills. A revision of this rate schedule is advised. It was found that the company was entitled to a rate-making basis of $6,243,907.13. This figure includes $200,000 allowed the company for "intangible values and working capital." The remainder is the property value of the plant and system as based on the company's valuation, made by the commission in 1914 and brought down to date by the present commission.

City Leases Power System.

Pasadena, Cal.—The city and the Southern California Edison company have concurred in an agreement after long discussion by which the city is to lease the power distribution system owned by the company within Pasadena for a term of two years. The lease must be approved by the State Railroad Commission. The value of the system agreed upon is $513,102.11. The city undertakes to pay an annual rental equal to 8 per cent and to pay at the same rate for extensions. Besides this, the city is to pay a sum equal to 3.36 per cent of the system's value on account of depreciation, these payments to be set aside in a depreciation reserve fund under certain specified conditions. The city will hold an option to purchase the company's distributing system in Pasadena at the price stipulated plus cost of additions thereto at the end of the two-year period. If the war still continues at the end of two years, then the lease may be extended under the same terms and conditions until the end of the war and for four months thereafter. The city agrees to purchase from the company at all times during the term of the lease such electrical energy as it may require, and at the termination of the lease, provided that the city acquires the company's distributing system, to continue purchasing all its electrical energy from the company until April 15, 1933.

The schedule for energy supplied by the company to the city is to be: For the first 250,000 kw.-hr. furnished during each month, 0.95 cent per kilowatt-hour; for the next 500,000 kw.-hr. furnished during each month, 0.90 cent per kilowatt-hour; for all over 750,000 kw.-hr. furnished during each month, 0.75 cent per kilowatt-hour.

The city is to have the right, upon giving thirty days notice, to take service upon an annual load-factor basis, the load factor being figured upon an average of the three highest peaks in a year, no two peaks being in any one month. The load-factor schedule is:

	Cts. per Kw.-hr.
Less than 44 per cent load factor.................	0.875
Less than 46 per cent but not less than 44 per cent.	0.85
Less than 48 per cent but not less than 46 per cent.	0.84
Less than 50 per cent but not less than 48 per cent.	0.82
Less than 52 per cent but not less than 50 per cent.	0.79
Less than 54 per cent but not less than 52 per cent.	0.77
Fifty-four per cent and over.....................	0.75

The steam plant of the city, with a rating of 6,000 kw., which now supplies electrical energy to the city's distributing system, will be maintained by the city and kept in condition for operation, but will be operated only upon the order of the company or when and during the time the service of the company to the city shall be interrupted and the operation of the plant reasonably necessary. Whenever the plant is operated the company is to pay all costs incident to putting it in operation and maintaining it during the period required, including interest and depreciation at the rate of 12 per cent per annum for said period on the depreciated value of the plant as carried upon the books of the city. During the period of the lease the provisions of the agreement will be carried out under the supervision of an "operating board," to consist of the manager of the city's electric department and a representative of the company.

The city agrees to lease and sell to the Edison company certain distribution lines belonging to the city outside the limits of Pasadena under the same terms and conditions as the Edison company's lines in Pasadena will be leased or sold to the city, and further agrees to confine its electric distributing business in future to the territory within the corporate limits of Pasadena, certain specified existing consumers outside the city excepted. During the term of the lease all additions and new business secured by the city are to be attached to and become a part of the respective systems of the city and the company in such manner and quantity that the new business and extensions measured in income will be so distributed that the present proportion of business as between the company and the city is at all times substantially maintained. The distribution of such extensions and new business will be subject to the operating board. The present proportion between the city's business and the company's business is determined as 56 to 44. The testimony submitted at the hearing before the commission indicated that Pasadena could make great economies in operation by the consolidation of the Edison company's Pasadena business with that of the city. No rate reductions were promised by the city in the near future. The Edison company will be a gainer by the agreement in that it will earn 8 per cent on its local investment instead of less than 5 per cent under existing conditions, and that it will supply a total of over 12,000,000 kw.-hr. annually to the territory within the city, instead of approximately 5,000,000 kw.-hr. as at present. Since December, 1917, the city of Los Angeles has been supplying Pasadena with some electrical energy, this being surplus energy from the aqueduct plant over and above that required by Los Angeles under its contract with the Edison company. At the hearing before the Railroad Commission in reference to the joint application of the city of Pasadena and the Edison company, the city attorney of Los Angeles entered a protest against the discontinuance of power service to Pasadena by Los Angeles which would follow the approval of the joint application made by Pasadena and the Southern California Edison Company. The existing contract between Los Angeles and Pasadena for surplus electrical energy contains a provision that it may be abrogated upon thirty days' notice by either. According to the attorney for Los Angeles, the protest was made along the lines of patriotic conservation. He stated that Los Angeles did not desire to embarrass Pasadena in the matter of its agreement with the Edison company, but that if the power service of Los Angeles city to Pasadena were discontinued, the Edison company would have to supply an equal amount of energy generated by steam. This statement was refuted by representatives of the company.

Company Must Make Extension.

Dover, N. J.—Describing as "absolutely indefensible" the position of the New Jersey Power & Light Company of Dover in refusing to make any extensions unless they are paid for by the persons desiring them, the state public utilities commission has ordered the company to extend its electric service to supply the house of a resident of Kenvil. After showing that the company had not hesitated to spend large sums of money for the purpose of generating electric current for the Wharton Steel Company, with which it has a profitable contract, the board added the following comment: "It would seem that when the contract for service is unusually attractive, the company has no difficulty in financing it, but when an extension involving the small sum of $90 is required, affording a return of between six and eight per cent net, it is not interested." The case was somewhat aggravated by the fact that before wiring his house for electric current, the consumer had obtained a promise from the company that the small extension necessary would be installed. This promise was made in the spring of 1917, but the company delayed making the extension from time to time. It finally refused point blank to make the extension unless the consumer paid for it, the understanding being that the company would refund in instalments at the rate of fifty per cent of the annual revenues derived from the extension.

FIRE AND POLICE

Forest Fire Causes Big Loss.

Westport, Me.—A forest fire which swept over the southern end of Westport, an island town in the Sheepscot river, was finally gotten under control after causing damage estimated at $200,000. The residents who had fought all night to keep the fire from spreading to the more populated portion of the island and endangering more than a hundred homes, were kept busy extinguishing the flames as they broke out anew at different sections of the fire zone. The greatest loss was on the summer cottages along the shore, which were owned mostly by residents of other states. Of 24 buildings burned, two-thirds were cottages, valued at from $3,000 to $15,000. Heavy losses to pine and spruce timberland also were sustained. The fire, believed to have been started accidentally by a match dropped by a workman engaged in setting up a portable sawmill, spread from the west to the east end of the island and burned toward the southern end, the wind carrying the flames away from the main part of the island. It covered territory three miles wide and four miles long.

More Than Hundred Killed in Munitions Explosion.

Oakdale, Pa.—Ninety-one bodies had been taken from the ruins of the Aetna Chemical Company's plant by the end of the third day following terrific explosions which wrecked the plant. At that time company officials said that 190 members of the working force of the plant were yet unaccounted for. The work of searching the ruins was halted by heavy rain, which, falling upon the acid-covered ground, caused deadly fumes to rise from the wreckage. Nine explosions wrecked the explosive manufacturing plant, which is sixteen miles from this city. Throughout the night and day following the catastrophe men were extinguishing small fires in the debris and were bringing out remnants of human bodies. In most cases there was nothing to identify the victim. While earlier explosions wrecked the plant, the last one blew the piles of debris clear of the ground and scattered them over more acreage than before, blackening everything beyond recognition. All during the first day after a brown smoke continued to hang over the ruins, considerably impeding the work of the searchers. For a time the work was impeded further by the thousands of sightseers, who flocked to the scene from the surrounding country. Automobiles blocked all roads to and from the place, and another company of the state constabulary was rushed in automobiles from Greensburg to establish a greater cordon about the scene of the disaster. The crowds were ordered back, and automobiles were turned back when they had reached within five miles of Oakdale. Later a complete cordon encircled the plant a mile and a half, and only those having business were admitted past the guards. Thousands of persons streamed into the temporary morgue all day to view the bodies, and it took a special detail of police to keep this morbid element in check. The country is desolate for an area of several miles around the plant, where the former green hillsides have been seared and burned by the blasts. The meadows and fields have been seared, and fruit and shade trees have been blasted and denuded of their foliage. The five hundred workmen were startled at noon by a report not much louder than the crack of a pistol. It came from the soda house, but they knew its deadly import and rushed for the nearest exit. Before they could gain the open the air seemed to burst into flame, the earth heaved and rocked, and with a roar that was heard for miles the long factory buildings were hurled into the air, carrying with them heavy equipment and scores of men. Many of the injured, some of whom were found half a mile from the remnants of the factory, were taken to Pittsburgh hospitals by special train and in ambulances in the afternoon and in the early evening, all of them so badly hurt that in only a comparatively few instances were physicians able to hold out any hope for their recovery. The property loss was estimated at $1,500,000. Immediately after the second explosion the mass of broken beams and twisted timbers broke out in a great blaze, while the highly inflammable chemicals used in the manufacture of the factory's deadly products—T N T and T N A—added ample fuel to the flames. Blast after blast followed as the heat reached the tanks, each one scattering the burning embers and endangering property in the entire community. Telephone and telegraph wires were wrecked by the explosion, and the tracks of the Panhandle railroad were blocked by ruins. With the first call for hospital aid and ambulances went a corps of nurses and physicians from St. Johns Hospital. One of these nurses, Meryl Aschelman, New Philadelphia, O., was acting as a stretcher bearer. A blast threw her to the ground and the patient on the stretcher was killed. Miss Aschelman lost one leg.

Four Firemen Killed in Collision with Car.

Vancouver, B. C.—Four city firemen were killed and one injured when a hose wagon, traveling at a high rate of speed while responding to a fire, struck a street car. The six passengers aboard the street car were uninjured. The dead are: Capt. Jack Frost, driver Otis Fulton, pipeman Colin MacKenzie and pipeman Donald Morrison. Pipeman Torquil Campbell was injured.

Firemen Injured in Lumber Yard Blaze.

Omaha, Neb.—Assistant fire chief Dineen and eleven firemen were injured, and several more were overcome by smoke in a raging fire, which spread through the Gross Lumber and Wrecking yards, burning over four adjoining residence blocks. More than a score of houses were totally or partially destroyed. The loss is estimated at $150,000. The direct cause of the fire has not been learned. It is believed it started from sparks emerging from a cupola of the Nebraska Foundry and Manufacturing Company, which settled in heaps of refuse in the rear of the wrecking yard. Every piece of fire apparatus in the city was at the scene. A brisk south wind aggravated the leaping flames, and they spread quickly to thickly congested houses in adjoining blocks. Within one hour the lumber and wrecking yards were totally devastated. Several houses three blocks away caught fire from burning fagots. Telephone and electric light wires within a radius of four blocks were down. While fire engines pounded furiously to increase water pressure more than thirty streams of water were poured on houses newly afire. So high was the gale that for a time it was feared the firemen could not gain control. Chief Salter was on the scene immediately following the first fire alarm. The second alarm was turned in twenty minutes later, followed by a third. Firemen from Benson and South Omaha were detailed to fire barns in the loop in order to be in readiness for emergency work.

GOVERNMENT AND FINANCE

Capital Issues Committee Begins Work.

Washington, D. C.—The War Finance Corporation, created by Congress at the request of Secretary McAdoo to finance war industries and limit and control investment of capital during the war, is now officially in existence, the directors and officers having been sworn in. The corporation has for its chairman of the board of directors Secretary McAdoo; as vice-chairman and general manager, W. P. G. Harding, governor of the federal reserve board, with Sherman Allen, formerly assistant secretary of the treasury and now assistant secretary of the federal reserve board, as treasurer and secretary pro tem. The board of directors, in addition to Messrs. McAdoo and Harding, consists of Clifford M. Leonard, Eugene Meyer, Jr., and Angus W. McLean. The members of the capital issues committee, which is to regulate investment of capital during the war, consists of Charles S. Hamlin, designated as chairman by President Wilson; John Skelton Williams, controller of the currency; Frederick A. Delano, of the federal reserve board; James B. Brown, John S. Rum, Henry C. Flower and Frederick H. Goff. The federal reserve banks will continue to finance business and industry; the function of the War Finance Corporation is to finance the investment banking of the country. The functions of the banks and the corporation are complementary, and full co-operation may be expected. The War Finance Corporation will start business with a capital stock of $500,000,000, all subscribed by the United States Government, and will have authority to issue bonds to the extent of $3,000,000,000 with which to finance its operations. The corporation will make loans to banks and trust companies making loans to finance "operations necessary or contributory to the prosecution of the war." These loans will be made for periods not exceeding five years and in sums not more than 75 per cent. of the face value of the loans made by the borrowing banks to finance "operations necessary or contributory to the prosecution of the war." The notes of the borrowing banks taken by the corporation for these loans will be secured by adequate collateral. The corporation may also make loans to savings banks and building and loan associations under certain circumstances, and may in some cases make loans direct to industries essential to the war.

The capital issues committee of the federal reserve board announced that the number of applications considered during the week ending May 11 was greater than in any previous week of its existence. The committee determined thirty-seven cases, aggregating $27,487,277.56, of which $4,811,000 were disapproved. In addition to the amount formally disapproved, postponement for the period of the war was secured informally of issues aggregating $4,990,000. The $22,676,277.56 approved included $6,777,084 of refunding obligations, so that the new issues approved aggregated $15,899,193.56. New issues for the corresponding period last year amounted to $14,196,500. The committee stated that spread of the knowledge of its aims and purposes continued to be reflected in voluntary postponement of security issues, the case being cited of the city of St. Louis, Mo., which has adopted a policy of financial preparedness consistent with the national welfare. The city has notified the committee that it is going ahead with securing local authority to create certain debts and advertising the issues of bonds therefor so that they may be marketed readily at the proper time, but that it will submit for approval by the committee only such issues as are for urgent and essential purposes. The city is at present advertising some $14,000,000 of bonds, which it does not purpose to market until the conclusion of the war. Other municipalities in federal reserve district No. 8 are adopting the same patriotic course. The Milwaukee member of the sub-committee of the Chicago federal reserve district reports that the city of Milwaukee, in bringing its needs into conformity with the national interest, has reduced presently contemplated bond issues from $5,740,000 to $1,050,000.

Tiny City to Disincorporate.

Coram, Cal.—This city, the tiniest in California, for it has only thirteen registered voters, has called a special election for May 28th to vote on the proposition of disincorporating. The city has been in existence for eleven years. It has never levied a tax and it is out of debt. It was with considerable difficulty that enough citizens could be rounded up to serve on the election board. Of the five trustees supposed to be on the board one is dead, one is in a state hospital, two have moved away. The only one left called the special election. The main reason for disincorporating is that it is too much trouble to make out the annual reports required of all municipalities by the state controller.

Voters Approve City Manager Plan.

Roanoke, Va.—Roanoke has adopted the commission manager form of government to replace the bicameral councilmanic form. The majority voting in favor of the change was 734. A commission will be elected June 11, and the city's government will pass into new hands September 1.

TRAFFIC AND TRANSPORTATION

St. Louis Car Fare Six Cents.

St. Louis, Mo.—Beginning June 1, street railway fares in this city will be six cents, the state public service commission at Jefferson City having granted the raise by a vote of three to two, to the United Railways. The rate will continue for one year unless it is changed by a subsequent order of the commission, or by an appeal by the city of St. Louis to the courts. Universal transfers will be issued, as at present, without additional cost. Half-fare tickets will be sold at the present rate of 2½ cents each. The company is required to place tickets on sale at convenient points throughout the city, in blocks of five, ten and 100 individual fares. The majority opinion and order concerns two main points. The first is whether the commission has the authority, under the constitution, to act in the case, and the second is whether the United Railways operating with the present fares would be able to meet its operating expenses, pay its debts and grant a wage increase to its employees. On the question of jurisdiction the opinion holds that the commission has the power to act and cites authorities. In considering the second point, namely, the inadequacy of the fare that has been in effect, the financial and physical condition of the property, as shown by the reports of city engineer Smith, officials of the United Railways and experts of the public service commission, is analyzed and the conclusion is reached that the revenues of the company, on the present basis, would be insufficient during the coming year, especially in view of the fact that no relief would be afforded by the so-called compromise franchise ordinance recently passed and approved, within the year that the fare increase is to remain in effect. The company is ordered to make monthly reports to the commission, showing its gross earnings and operating expenses under the new system. The commission retains jurisdiction of the case, and may change the fare schedule after its engineers and accountants complete a valuation of the property. The commission has determined to make such a valuation during the coming year. In the present case the commission took $52,800,000 as the value of the property.

Federal Investigation of Shipyard Transportation.

Washington, D. C.—The United States Shipping Board recently assigned A. L. Drum to direct a survey of transportation conditions in the population areas serving the eastern shipbuilding plants with a view to improving and extending the local passenger transportation facilities so as to serve the employes now at work. It was also to determine the extent and reduce as far as possible the expenditures for new housing for the shipyard forces. Traffic surveys and plans were made for improving the transportation facilities for twenty-eight shipyards now employing 70,100 men and requiring an increase of 67,000 men. At these shipyards and the adjacent war industries 96,400 men are employed. Altogether it is estimated men required to be engaged on the work of ship building and adjacent war industries work will be nearly 200,000 at the following locations: Savannah, Newport News, Baltimore, Sparrows Point, Camden, Gloucester, Newark Bay, Staten Island, Newburgh, N. Y., Port Jefferson, L. I., Fore River and Squantum at Boston, Portsmouth, N. H., Groton and Bath, Me. The survey revealed that most of the shipyards requiring additional housing were on marshy land and subject to unhealthy conditions, and that it was necessary to locate any new housing a mile or two distant from the yards and consequently requiring electric railway or steam railroad transportation for the men. It was found that at many plants some new housing would be necessary. Permanent houses will usually require local transportation and will cost on an average of $1,500 per man for the houses. For barracks located near the shipyards the cost is about $350 per man. Estimates show that where about two miles of track extension are necessary from existing lines to the shipyards and a full complement of cars, substations, feeders and carhouses is required the investment averages about $150 per man to be transported. According to these statistics the investigators were convinced of the economy of developing existing transportation facilities over the making of large investments in temporary or permanent housing, even if the extension were afterwards abandoned, because the cars and power supply, representing less than one-half the investment for even barracks would be available for future use. The whole development planned includes increasing ferry boat service with existing boats, increasing steam railroad service with existing rolling stock, and making electric railway extensions and adding cars and power supply at a total cost of about $9,000,000. This includes $2,400,000 to be provided by the Pennsylvania Railroad and the Hudson & Manhattan Railroad for extending the Hudson Tube service to the Lincoln Highway at Port Newark, N. J., where it will serve 50,000 men. After planning to utilize the existing housing to its utmost capacity by improving the transportation facilities the next effort was to permit the use of these transportation facilities to their fullest extent by spreading the shifts at the shipyards from one hour to one hour and one-half in order to secure two round trips in the morning and evening with each car in the service. The management of the shipyards are now working out plans for spreading their shifts an hour and thirty minutes.

Strike May Lead to Six-Cent Fare.

Rochester, N. Y.—After a three-day strike, the motormen and conductors employed on the lines of the New York State Railways in this city returned to work. The men had been offered an advance in wages of 4 cents an hour, but they refused. They accepted the offer, however, after the tie-up. It was also stipulated by James F. Hamilton, vice-president and general manager of the company, that if the Rochester municipal authorities allow the company to increase its rate of fare from 5 cents to 6 cents, an additional wage increase will be granted. The men were receiving a sliding scale of 27, 29 and 31 cents an hour according to the length of time they had been in the company's service. They demanded a wage increase to 40, 42 and 44 cents an hour. The company said it was unable to pay this, and Mr. Hamilton has offered to submit the company's books, records, etc., to the city to show that it cannot operate at a profit and pay the men higher wages with a 5-cent fare. This investigation is under way by the city authorities. About 1,300 men were involved in the strike. The company admitted that the men should have more money, but told them that the company was not in a financial condition to pay a higher wage. The company announced that a 4-cent an hour increase would be granted to the platform men, retroactive almost nine days. The men, however, agreed to strike and left the thousands employed in war industries without transportation facilities. The company made no effort to run cars and there was no disorder. After a series of conferences between representatives of the men, the federal war department, the municipal authorities and the company, the men agreed to return to work under the original offer. In addition to the wage advance, the regular run men are guaranteed ten hours' work each day. Other changes in working conditions are subject to arbitration between the company and the men. M. & L. W. Scudder, New York, accountants, have been engaged by the city to investigate the financial condition of the company. While there is much opposition to the 6-cent fare, it is thought that it will be granted if the report of the accountants is favorable to the company.

MISCELLANEOUS

Research Bureau's War Service.

Philadelphia, Pa.—For several months the Bureau of Municipal Research of this city has been operating a "war information booth" in the city hall court yard. An attractive pavilion, located at the crossing of the city's two principal streams of foot traffic, is "manned" by a paid staff of intelligent young women who answer a large number of inquiries daily. The bureau found that there are so many recruiting stations, Red Cross and other relief offices, employment agencies and other centers of activity that the eager volunteer, the troubled mother and the war gardener are at a loss where to go for information. The information booth acts as a clearing house and directs such inquirers to the proper source, or else answers the query directly. Among the usual topics of inquiry are the following: War gardens, activities of various war organizations, home service, food economics, recent war legislation, foreign mail regulations, enlistment, employment, location of cantonments and shipyards, housing, casualty lists, etc. According to Sedley H. Phinney, acting secretary of the bureau, this service has proved a great conserver of both energy and enthusiasm, and is universally regarded as a real success.

To Build $40,000,000 Supply Base.

New York, N. Y.—It has been announced by the Turner Construction Company that it has obtained the contract for the erection of the supply base for overseas transportation, and that it will build for the War Department a freight and steamship terminal that will cost approximately $40,000,000. The new terminal will improve and enlarge the terminal facilities already in South Brooklyn. One feature of the plans is that it is proposed to erect the largest building, the company claims, that was ever built in the world. The plans for this and the other structures were prepared by Cass Gilbert, under the direction of General Goethals, Director of Storage, Transportation, and Purchase. The building is to have 6,000,000 square feet of fireproof floor space and will be approximately 1,000 feet square. It will take eight or nine stories to allow for this space under one roof, as the plan calls for the lighting of the building by one street and three courts. In addition to these housing facilities the plan includes also the construction of piers larger than any other in New York and capable of furnishing berthing space for the largest steamships in the world. There will be built here three doubledeck, steel, concrete, and timber piers 1,300 feet long and 150 feet wide, together with a lighterage pier of 1,350 by 70 feet wide. This will be one story in height. About thirteen miles of railroad track will be laid down to serve the base, and it will take 150 elevators to handle the 1,000,000 tons of goods to be stored. It is stated that twelve 8,000-ton ships can be loaded in one day when the plant is working at maximum capacity. This project will, it is estimated, require 1,250,000 cubic yards of dredging. One of the objections advanced by those who have opposed the Goethals plan for improvement in South Brooklyn has been that the work could not be made ready for use in less than two years. The Turner Construction Company announced that it hopes to give the Government the partial use of the great building by the end of this year, and that the entire project will be completed by next spring. The work will be started at once, and it is planned to keep 7,000 men at work when under way. According to some opinions, the Brooklyn establishment will be built in the face of opposition expressed by the railroad administration and against the judgment of railroad and shipping experts in New York who insist that it will not be possible to deliver freight by rail or water sufficiently to fill the gigantic warehouses. The new base is intended to provide accommodations for shipments from the west and south, the situation in New England in the matter of military supply accumulation and distribution being met by the Boston plant. The railroad approach to the Brooklyn plant is described as inadequate and it is predicted there will be difficulties in handling material on the wharves.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

May 27-June 1.—CANADIAN PUBLIC HEALTH ASSOCIATION. Meeting with Ontario Health Officers' Association, Hamilton, Ont. Secretary, J. G. Fitzgerald, Toronto, Ont.

May 27-29.—NATIONAL CITY PLANNING INSTITUTE. Annual conference, St Louis, Mo. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, P. O. Box 1015, Washington, D. C.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 5-7.—NATIONAL MUNICIPAL LEAGUE. Annual meeting, New York, N. Y. Secretary, Clinton Rogers Woodruff, North American Bldg., Philadelphia, Pa.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 11-13.—MAYORS AND OTHER CITY OFFICIALS OF NEW YORK STATE. Annual conference, Newburgh, N. Y. Secretary, William P. Capes, 25 Washington St., Albany, N. Y.

June 19-21.—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual meeting, Atlantic City, N. J.

June 19, 20.—LEAGUE OF TEXAS MUNICIPALITIES. Sixth annual convention, in cooperation with the Texas Commercial Executives' Association, San Antonio, Tex. Secretary, Edward T. Paxton, University of Texas, Austin, Tex.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

Oct. 2-4.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual meeting, Buffalo, N. Y. Secretary, Charles Carroll Brown, 304 E. Walnut St., Bloomington, Ill.

National Municipal League.

One of the most important annual meetings ever held by the National Municipal League will take place June 5 and 6 in New York City in conjunction with the National Conference on War-Time Economy, called by the Academy of Political Science and the New York Bureau of Municipal Research. The plans were determined by the council of the National Municipal League at its semi-annual meeting in New York City, April 24, after a careful canvass of the whole situation. The Governmental Research Conference will meet at the same time and possibly some of the other organizations that have heretofore met with the league.

The program of the National Conference on War-time Economy includes a discussion of "War Economy and Financing Local Governments," "The Government as Employer," "The Need of a Budget," "The Duties of City and State Governments During War Times," "Executive Leadership in a Democracy."

The league's program will include the discussion of such questions as:

Federal Relations to American Municipalities.

War-Time Work of Civic Organizations.

What Are Necessary Municipal Improvements?

State and Local Government in the Light of War Necessities.

A Scheme for Legislative Leadership.

The City Manager Plan as a War Measure.

Reorganized Justices' Courts: An Essential to World Democracy.

The day sessions of the meetings of the National Municipal League on Wednesday, June 5, will be at Greenwich House, one of the leading social settlements in New York, of which the directress is Mrs. Mary K. Simkhovitch, a member of the council.

The tentative program of sessions is as follows:

Wednesday, June 5. 10 a. m.—Opening session, National Municipal League, Greenwich House. 10 a. m.—Governmental Research Conference, at New York Bureau of Municipal Research, 261 Broadway. 10 a. m.—Civic Secretaries' Conference, Greenwich House. 1 p. m.—Luncheon at Greenwich House for National Municipal League, Civic Secretaries. 1 p. m.—Luncheon at Greenwich House for Governmental Research Conference. 3 p. m.—Joint session, National Municipal League, Governmental Research Conference and Civic Secretaries, Greenwich House. 8 p. m.—Opening session of War-Time Economy Conference, Columbia University.

Thursday, June 6. 10 a. m.—Sessions of War-Time Economy Conference, Hotel Astor. 1 p. m.—Luncheon, Hotel Astor. 7 p. m.—Joint war-time supper at City Club, 55 West 44th street.

The first session of the war conference, to be held at Horace Mann Auditorium, Columbia University, on Wednesday night, will be devoted to "Executive Leadership in Democracy," and will be presided over by R. Fulton Cutting, chairman of the board of trustees of the New York Bureau of Municipal Research. After the introductory address and the address of welcome by President Nicholas Murray Butler of Columbia University, Frederick A. Cleveland, Industrial Service and Equipment Company, Boston, Mass., will discuss "Recent Growth of Executive Leadership." There will follow a "Symposium on Executive Responsibility for War Economy," in which governors Carl Milliken of Maine, Martin G. Brumbaugh of Pennsylvania, Frank O. Lowden of Illinois and Emerson C. Harrington of Maryland and other war governors will record briefly the war work of their respective state governments.

The second session, held in the Belvedere Room of the Hotel Astor, will deal with "War Economy in Financing Local Governments." The presiding officer will be Mortimer L. Schiff, of Kuhn, Loeb & Co., New York. The program will be as follows: "The Pay-as-You-Go Policy in New York

(*Continued on page 442*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Monrovia, Cal., is making WATERWORKS improvements to cost $42,500. The consulting engineer for the work is W. S. Jones.

Two SEWAGE DISPOSAL PLANTS are to be built by Stockton, Cal., the consulting engineer for the work being F. H. Tibbetts.

DRAINAGE IMPROVEMENTS are to be made by Tunica, Quitman and Panola counties, the plans having been completed by the Morgan Engineering Co.

A SEWERAGE SYSTEM and SEDIMENTATION TANK are to be built by Shelbyville, Ky., plans having been prepared by the consulting engineer, Charles E. Collins.

In its controversy over the plan of the New York Railways Company to institute a six-cent FARE, the city of Rochester, N. Y., has retained the firm of accountants, M. & L. W. Scudder, to investigate the finances of the company.

Kirkland, Wash., is making STREET IMPROVEMENTS. The engineers for the work are the firm of Gardiner & Gardiner.

Belton, Mo., is to build a DAM and LAKE. The engineers for the work are the firm of Henrici, Kent & Lowry Engineering Co.

The SEWERAGE SYSTEM of Milford, Mass., is to be extended. The engineer for the improvement is Owen Barbour.

STREET IMPROVEMENTS are to be made by Ashland, Wis., plans and specifications for the work having been completed by the consulting engineering firm of Reichardt & Pierce.

McAlester, Okla., is to build a new SEWAGE TREATMENT PLANT and WATERWORKS to cost between $500,000 and $600,000. The consulting engineering firm of Burns & McDonnell has been retained to prepare plans and specifications for the improvements.

INDUSTRIAL NEWS

Cast Iron Pipe.—Cast iron pipe manufacturers are very concerned over their present inability to obtain enough pig iron to keep in anything approaching full operation. While some of them are doing a great deal of government business, most of them also are doing a larger percentage of general business or are furnishing pipe for purposes that are not considered strictly as "war work." The American Waterworks Association will send a petition to Washington, urging that cast iron pipe be placed in a preferred class as necessary for the preservation of the public health, particularly in towns which have been growing rapidly on account of war business, and find it necessary to extend their corporate lines and build many new houses. Government prices remain constant. Quotations: Chicago, 4-inch, Class B and heavier, $57.30; 6-inch, $54.30. New York, 4-inch, Class B and heavier, $58.35; 6-inch, $55.35; 3-inch, $65.35. Birmingham, 4-inch, Class B and heavier, $52; 6-inch, $49; Class A $1 extra.

The Pittsburgh Filter Manufacturing Company, Pittsburgh and Oil City, Pa., has started the publication of a monthly house organ, entitled "Shop and Field News," which is "devoted to the mutual co-operation and interest" of all associated in the business of the company. It is readable in style and chronicles personal items, events and opinions. The first issue also contains an illustrated description of the new filtration plant of Tulsa, Okla., recently installed by the company.

Government Price Fixing on Cement.—One of the most important recent developments in the construction industries is the announcement of the final arrival at a price adjustment between the government and the Portland cement manufacturers of the Lehigh Valley and Hudson districts. This quotation has been placed at $1.75 for Lehigh Valley, or Zone 1 production, and $1.85 for Hudson Valley cement. These levels represent an advance of 45 cents a barrel over the quotations formerly made on government orders, base Lehigh, prior to the development of higher cost of manufacture since this country went to war a little over a year ago. The new prices are 15 cents below the mill quotation for commercial business.

Simultaneous with this announcement comes word out of both districts that the coal situation is becoming easier and the threatened restriction of output does not now promise to be quite so acute. The larger construction programs outlined by the government and by the United States Steel Corporation have injected new factors into all classes of building materials, especially with relation to supply, and it is not at all improbable, in the minds of some interests, that a construction program running into the billions of dollars will draw so heavily upon the limited supplies of building materials on hand in the eastern part of the country that orders recently promulgated may have to be revised to permit husbanding of reserves adequate for immediate future requirements.

Army to Buy Small Trucks.—The purchase of commercial types of trucks for army use instead of the development of two smaller types of the Liberty trucks has been ordered by the War Department. It is understood that the manufacture of the large three-ton Liberty truck will continue. Orders will be placed immediately for 1,500 three-quarter-ton trucks probably with the General Motors Company and for 2,500 chassis of one and a half tons with different makers. About 2,400 large type Liberty trucks have been produced. The output probably will reach 10,000 by August 1. Plans contemplate 8,000 more and 8,000 large commercial trucks of three to five tons capacity, with four-wheel drive.

NEWS OF THE SOCIETIES

(Continued from page 441)

City," by Charles L. Craig, comptroller; "The Regulation of Capital Issues for Local Improvements and Maturing State and Municipal Debts," by Paul M. Warburg, vice-governor, Federal Reserve Board, and "A War Chest for Public Improvements," by Andrew J. Peters, mayor of Boston.

At the luncheon session at the Hotel Astor the general topic will be "The Government as Employer." Brief addresses will be made by representative labor leaders and government officials, including Franklin D. Roosevelt, assistant secretary of the Navy; Samuel Gompers, president of the American Federation of Labor, and V. Everit Macy, chairman of the Shipbuilding Labor Adjustment Board.

"The New Era in Budgets" will be the theme of the fourth session, held at 3 p. m. Thursday in the Belvedere Room of the Astor. The presiding officer will be Victor Morawetz, and the following program will be presented: "First Steps Toward a Budget System," by W. F. Willoughby, director, Institute for Governmental Research, Washington, D. C.; "The New Jersey Budget Law," by Arthur N. Pierson of the New Jersey Assembly, chairman of the Commission for the Survey of Municipal Financing of New Jersey; "Budget Reorganization in Illinois," by Governor Frank O. Lowden; "The First State Executive Budget," by Governor Emerson C. Harrington of Maryland, and discussion of the general topic by Howard L. McBain, professor of municipal administration at Columbia University, and Thomas W. Lamont, of J. P. Morgan & Co.

At the joint war-time supper at the City Club informal discussion will be centered on "New Duties of City and State Governments in War Times."

The president of the National Municipal League is Lawson Purdy of New York, and the secretary is Clinton Rogers Woodruff, 703 North American Building, Philadelphia, Pa.

Associated Highways Organizations of Pennsylvania.

The Associated Highways Organization of Pennsylvania was formed at a meeting of good roads enthusiasts recently held in the Capitol at Harrisburg. It is a federation consisting of representatives of all good roads organizations in the state. Represented at the meeting were the Lincoln Highway, William Penn Highway, National Old Trails, Buffalo-Pittsburgh trail, McKean, County Good Roads Association, Jefferson County Good Roads Association, the Lackawanna trail, Sullivan trail, Susquehanna trail, Perry Highway, Trans-Pennsylvania Road Association, Black Diamond Highway and other organizations. Officers elected were: Ex-Senator John S. Fisher, Indiana, president; Dr. P. T. Johnson, Erie, vice-president; William Jennings, Harrisburg, treasurer, and M. H. James, Harrisburg, secretary.

American Association of Engineers.

The American Association of Engineers, at the annual convention to be held in the City Club, Chicago, May 14, elected a president and a board of directors, the nominations for which, recently announced, were as follows:

President—W. H. Finley, chief engineer, C. & N. W. Ry.

First Vice-President—H. W. Clausen, construction engineer, city of Chicago.

Second Vice-Presidents—L. K. Sherman, Chicago, president L. K. Sherman Company, engineers; A. D. Whipple, Chicago, chief engineer, Portland Cement Association.

Directors—Harold Almert, consulting engineer, Chicago; F. K. Bennett, Minneapolis, assistant chief engineer, M. & St. L. Ry.; T. M. Chapman, Savannah, Ga., land and tax engineer, C. of Ga. Ry.; C. U. Freund, civil engineer, Washington, D. C.; W. A. Goss, Chicago, engineer, Interstate Commerce Commission; J. N. Hatch, Chicago, consulting engineer; Samuel Morcel, engineer of bridges; city of Chicago; Charles A. Morey, president, Chicago Technical College; Alexander Potter, New York, consulting engineer; J. H. Prior, Chicago, consulting engineer; Warwick Ray, Chicago, engineer, Western Electric Co.; C. B. Reed, Chicago, engineer, Illinois Central Railway; E. O. Schweitzer, Chicago, chief testing engineer, Commonwealth Edison Company; C. B. Scott, Richmond, member, Virginia State Highway Commission; F. L. Thompson, Chicago, assistant chief engineer, I. C. R. R.; P. B. Waldin, Pittsburg, district sales manager, Marchant Calculating Machine Company; F. R. Weller, Washington, consulting engineer.

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USE OF TAR ON HIGHWAYS*

English and American Practice in the Construction of Tar Surfaces and Pavements—Construction Methods and Appliances—Foundations, Road Metal and Construction of Tar Macadam Pavements.

By ARTHUR H. BLANCHARD†

DESTRUCTION OF BITUMINOUS CONCRETE PAVEMENT DUE TO INADEQUATE PROVISION FOR DISPOSAL OF SURFACE DRAINAGE.

TAR SURFACES.

Classification: Tar surfaces may be considered as divided into two classes: Thin superficial coats of tar, with or without the addition of such materials as stone chips, fine gravel or sand. (After one to two years' wear, the road metal or other material composing the wearing course is exposed.) 2—Coats of tarred material of appreciable thickness, usually over ½-inch, formed by the application of one or more treatments of tar with sand, gravel or stone chips added; known as tar carpets or blankets. (They rarely wear down uniformly to the wearing course and hence increase unevenly in thickness by re-treatments.)

Construction: Before constructing a tar surface on a broken stone or gravel road, every precaution should be taken to secure the best subdrainage which is practicable under the local conditions. Also all depressions, potholes, ruts, or other irregularities should be filled with thoroughly compacted tar-coated stone, so that the whole surface of the roadway is even. All surplus dust must be removed so that the larger pieces of broken stone of the roadway surface are exposed but without breaking the bond. This cleaning process is accomplished by the use of horse sweepers and fine bass brooms, of coarse fiber brooms and fine bass brooms, or by a vacuum process. If there is caked mud on the surface of the roadway, wet brushing will prove advantageous.

The character of the cleaned surface will be affected by the original construction of the roadway. If large size stone varying from 1 to 2½ inches in longest dimensions was used for the top course of a broken stone road, and the stone is hard and tough, the desired surface can be secured easily. The surfaces of the large stones in such a roadway are easily cleaned by brushing without the dislodgment of stones in the surface. A clean mosaic surface is of the utmost importance from the standpoint of the formation of a satisfactory bond between the broken stone and the tar. The maintenance of tar surfaces on wearing courses of large broken stone is economical, since after the tar surface wears away in spots, the mechanically interlocked large stones will of themselves generally have sufficient stability to withstand the effects of traffic until re-treated. On the other hand, if the top course of a broken stone road has been constructed of a product varying in size from ¼ to 1¼ inches, it will be very difficult, if not impossible in the case of soft stone, to secure an even, clean surface. Even after thorough brushing, a film of impalpable dust usually covers the surface of the roadway. During hard brushing small depressions will probably be formed by the displacement of pockets of dust and the smaller sizes of stone. Furthermore, the wheels of vehicles may adhere to the tar and thus tear up the small mineral matter adhering to it. As soon as the tar surface wears out in

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*Paper before the Fifth Canadian Good Roads Congress at Hamilton, Ont., on May 8, 1918, slightly condensed.

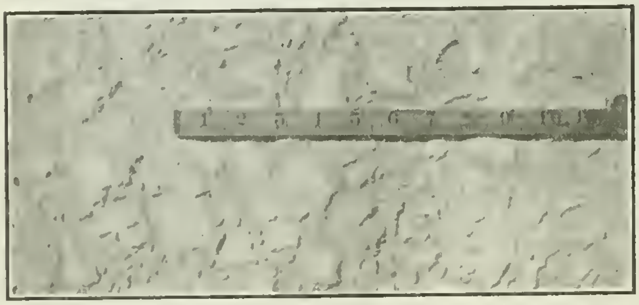
†Consulting Highway Engineer, New York City.

TYPES OF BRUSHES USED IN CLEANING MACADAM SURFACES PREPARATORY TO CONSTRUCTING A TAR SURFACE. LEFT—RATTAN. RIGHT—BASS.

spots, rapid disintegration of the exposed broken stone or gravel surface, with the consequent formation of pot-holes, is apt to occur.

If a tar surface is to be constructed on a new broken stone or gravel road, or on one which has just been resurfaced, the tar should not be applied until the crust has had time to consolidate under the action of traffic and with the aid of the binding action of dust and moisture. If it is impracticable to postpone the surface treatment, special care should be taken to secure a maximum consolidation of the crust of the roadway by puddling and rolling.

When the tar is being applied the roadway surface should be bone dry. If the surface is damp it will be difficult to secure a good bond. The tar may be distributed either by gravity or by mechanical pressure. The use of gravity distributors has not been developed to its fullest extent in America, in that the use of mechanical brushes or the brushing of the material into the road by hand brooming has never been adopted extensively. By brushing after gravity distribution, it is possible to distribute uniformly one-quarter to one-fifth gallons of tar per square yard. In some cases, when the distribution is accomplished by hand brooming, the adhesion of the material to the road metal is as good as when the material is applied under pressure. The advantages claimed for pressure distributors are: aid in cleaning the surface of the roadway, even application, distribution of small amounts per square yard, satisfactory adhesion obtained between the tar and the surface of a clean, dry roadway, and rapid and economical distribution.



SURFACE OF WELL CONSTRUCTED BROKEN STONE FOUNDATION.

As a general rule from ¼ to ½-gallon per square yard is used for the first treatment, preferably in two applications. The amount applied per treatment depends upon the kind of tar, the character and condition of the surface, and the details of the method of application. For example: A smooth surface composed of large sized, tough, hard stone and well compacted by traffic, would require from 0.25 to 0.35 gallon; for a somewhat rough surface of stone having a medium toughness and hardness and recently re-surfaced, it would be necessary to use from 0.35 to 0.5 gallon per square yard to form a satisfactory thin tar surface.

The superficial coat of tar is usually covered with either coarse sand, fine gravel, or stone chips varying from ⅛ to ½-inch in longest dimensions. Material containing clay should not be used, as disintegration may result by the emulsifying of the clay and water on the tar surface. The amount of sand, stone chips, or gravel used per square yard depends upon the quantity and kind of the tar, and the character of the surface of the roadway. From 5 to 20 pounds per square yard have been used satisfactorily for thin tar surfaces; 5 to 12 pounds for from 0.1 to 0.25 gallon of tar per square yard; 10 to 17 pounds for 0.25 to 0.35 gallon; and 15 to 20 pounds for from 0.35 to 0.5 gallon.

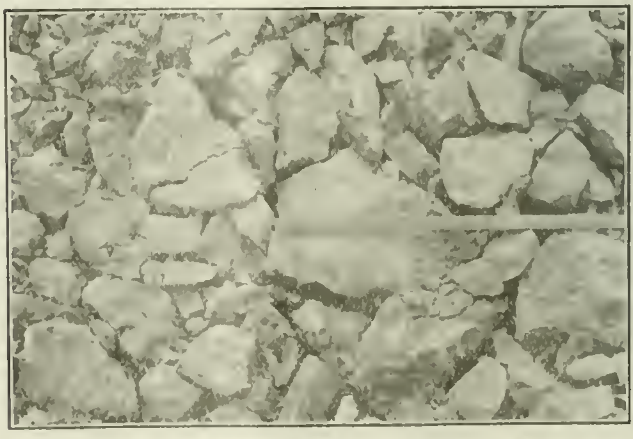
Cost Data: Under normal conditions, with labor and foreman at $2.00 and $4.00 respectively for an 8-hour day; teams $5.00 per day; refined tar applied, 7 to 9 cents per gallon; and top covering $2.00 to $2.25 per ton delivered; the cost of tar surfaces, using from 0.25 to 0.4 gallon of tar per square yard, will vary from 4 to 8 cents.

TAR MACADAM PAVEMENTS.

A tar macadam pavement is one having a wearing course of macadam with the interstices filled by a penetration method with a tar cement.

Foundations: Usually tar macadam pavements are constructed on broken stone or gravel foundations. In cases where traffic conditions require rigid foundations or where materials satisfactory for cement-concrete may be secured at a much lower cost than broken stone, cement-concrete foundations have been used and have been found to be satisfactory and economical. The more general use of cement-concrete foundations is advisable on trunk or other highways where traffic is liable to increase rapidly, both in amount and weight. When it is necessary to construct a more durable type of wearing course than tar macadam, the cement-concrete foundation previously constructed proves a valuable asset and allows reconstruction to be accomplished economically.

Physical Properties of Road Metal: The weight to be given to toughness and resistance to abrasion depends primarily upon the traffic to which the pavement will be subjected and the details of the method of construction adopted. For example, for many highways serving as feeders to state trunk routes, a rock having a toughness of not less than 6 and an abrasion loss of not more than 6 per cent. would prove economical and satisfactory; but if used on state trunk highways subjected to horse-drawn or motor trucks, rock having a toughness of not less than 13 and an abrasion loss of not more than 3.5 per cent. should be employed. In cases where rock with suitable toughness and wearing quality is not locally available, satisfactory results may be obtained by im-



EXAMPLE OF POOR PRODUCT OF BROKEN STONE FOR WEARING COURSE OF TAR MACADAM PAVEMENT.

porting the broken stone for the surface of the pavement and using local rock for the lower part of the crust.

In order that road metal should interlock during compaction and thus provide a stable wearing course, a proper angularity is an important prerequisite. The road metal should not contain over 5 per cent. of particles having small acute angles, nor should the product contain slivers. Road metal which has a rough or coarse grain or pitted surface is preferable to material with smooth or glassy surfaces, as the tar cement adheres more satisfactorily to the former than to the latter. Cleanliness is an essential quality of road metal for the wearing course of tar macadam pavements. It is difficult and usually impossible to secure a good adhesion of the tar cement to road metal which is not clean.

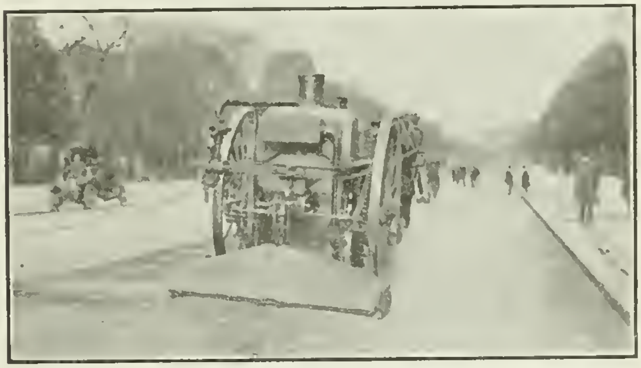
Construction: In the construction of tar macadam pavements it is desired to secure, (1) a stable wearing course consisting of broken stone or similar material thoroughly rolled so that it will be well compacted and keyed together and with the several sizes of material uniformly distributed, and (2) a uniform distribution and penetration of the tar within the upper 1½ to 3 inches of the crust. Several methods of construction have been devised with a view to meeting the above prerequisites. Careful supervision, based on experience, is necessary to prevent non-uniformity in the density of the wearing course of broken stone and in the amount of tar applied per square yard. It is evident that uniform application of the tar will depend upon the method of distribution employed. In using vehicular distributors, one cause of uneven distribution of the tar is overlapping of applications. The use of strips of tar or wrapping paper, from 3 to 5 feet in width, placed at the edge of an application has prevented sections of the wearing course receiving double the amount of tar cement specified.

A typical American method of construction is as follows: The metalling of the wearing course is a uniform product of about 1 or 1½ inches in size or a product similar to or larger than one passing over a 1½-inch and through a 2½-inch screen, and the voids in the upper part of the wearing course are filled after the tar is applied. Practice varies with reference to the amount of rolling of the wearing course prior to the application of the tar cement. For traffic medium or heavy in weight and amount, the best results have been secured by thoroughly rolling the road metal and thus securing maximum interlocking of the particles and thereby securing the highest degree of stability practicable by this method. The tar cement is applied in an amount varying from 1½ to 2 gallons per square yard, after which ⅜-inch stone chips or a product similar to one passing a ½-inch and through a 1-inch screen is spread and thoroughly rolled. Usually the surface is then broomed with stiff brooms, removing the excess loose broken stone, and another coat of tar cement from one-third to one gallon per square yard, is applied, covered with a layer of stone chips or pea gravel and rolled.

HAND SPRAYING OF TAR BY BRITISH ENGINEERS.

HAND-DRAWN AMERICAN PRESSURE MACHINE.

A tar macadam pavement called "Pitchmac" by its inventor, J. A. Brodie, city engineer of Liverpool, has been used to a considerable extent in England and has been adopted as a standard type by the Road Board of England. It is constructed on a foundation of stone. The wearing course of broken stone varies from 2 to 4½ inches in depth, dependent upon traffic conditions. If the wearing course is from 2 to 3 inches in thickness, it is constructed in one layer, and if from 4 to 4½ inches, in two layers. The single layer and, in the case of two layers, the upper layer is composed of broken stone ranging in size from 1¼ to 2½ inches. After thorough rolling the tar compound is applied to the single layer or to each of the layers of the two-layer wearing course. The tar compound used in England consists of hot sand mixed with tar pitch. From 1¼ to 2 gallons per square yard are used for the one-layer wearing course and from 3¼ to 3½ gallons for two layers. To assist in completely filling the voids, chips varying in size from ⅜ to ¾ inch, are applied during the rolling of the tar-grouted layer. The oldest sample of Pitchmac in Liverpool was laid in Princes avenue, in 1901, near the end of Eversley street, and has been in continuous use ever since without repair. This avenue carries a large volume of light motor and carriage traffic, as well as some of a heavier character, the traffic amounting to 120,000 tons per yard width per annum.



FRENCH PRESSURE DISTRIBUTOR IN USE ON ARC DES BOIS DE BOULOGNE.

Pitchmac has been used to a limited extent in Massachusetts. The writer is indebted to Arthur W. Dean, chief engineer of the Massachusetts Highway Commission, for the following authoritative and instructive data covering the cost of construction and maintenance of Pitchmac pavements having top courses of 2 inches filled with tar and sand and foundation courses of 4 inches of broken stone.

Cost of Constructing and Maintaining Pitchmac Pavements.

Massachusetts Roads.	Year of Construction.	Cost of Construction.	Maintenance Cost per Square Yard.	Condition in 1918.	Traffic Conditions.
Tyngsboro W.	1913	$1.01	$0.0118	Good	Medium
Natick E.	1914	1.12	0.0191	Good	Heavy
Newton	1914	1.21	0.0118	Good	Medium
Reading S. ...	1914	1.18	0.0266	Good	Very heavy
Wayland	1914	1.46	0.0175	Good	Very heavy
Gloucester W.	1915	1.15	0.0141	Good	Medium
Boston	1916	1.20	0.0000	Good	Heavy

Notes: The character of traffic on the several sections is as follows:

Tyngsboro W. Heavy Pleasure travel, truck and logging teams, in Spring and Fall.

Natick E. Pleasure cars, trucks, between Framingham and Boston.

Newton. Pleasure cars 70 per cent, 15 per cent trucks, 15 per cent teaming.

Reading S. Pleasure cars. Very heavy trucking.

Wayland. Pleasure cars. Very heavy trucking.

Gloucester W Pleasure cars 80 per cent, trucks 10 per cent, teams 10 per cent.

Boston. Mostly trucks and teaming, pleasure cars 30 per cent.

Notes: Maintenance cost is average per square yard per year since surface was laid and with exception of Reading S. is entirely for sanding. There having been no repairs made or necessary, nor probably will be for some years. At Reading the contractor had poor workmen and early corrections were necessary on that account. The sanding was necessary mostly on account of surplus tar on surface and perhaps 25 per cent for slipperiness during cold weather. Notice no repair expenses at Boston, due to perfect workmanship. This is partly the result of experience, as it is the latest piece laid and can be equalled under favorable conditions.

Distributors: The appliances used in the distribution of tar cements may be classified as gravity distributors and pressure distributors. The market is supplied with so many different types, that a thorough investigation should be made preceding the purchase of a machine. The following factors should be given consideration when selecting a distributor: (1) character and range of work upon which the distributor will be used; (2) present and probable requirements in specifications pertaining to type and details of distributors and the work to be done; (3) different types and grades of tar cements which the machine will distribute, and the range in the amount per square yard which can be applied; (4) gravity or pressure distribution, and, if the latter, the range in pressure per square inch; (5) method of controlling uniformity and amount of distribution; (6) accessories of distributors for heating material, recording temperature of tar cement, amount in tank, and amount of pressure, and shutting off tar cement at end of run; (7) width of distribution and means for modifying same; (8) motive power; (9) width of tires and loads per linear inch of tires when tank is full; (10) ease of operation and repair; (11) structural strength; (12) amount and character of labor required to efficiently operate the distributor; (13) economics, including overhead, operation and maintenance charges.

Cost Data: The cost of tar pavements built by penetration methods varies with the amount and kind of tar cement and road metal used, and the method of construction employed. An average cost, using 6 to 8 inches of compacted broken stone and a total of 2 to 2¾ gallons of tar cement per square yard, varies from 25 to 40 cents per square yard in excess of the cost of waterbound broken stone roads, or from 70 cents to $1.25 per square yard.

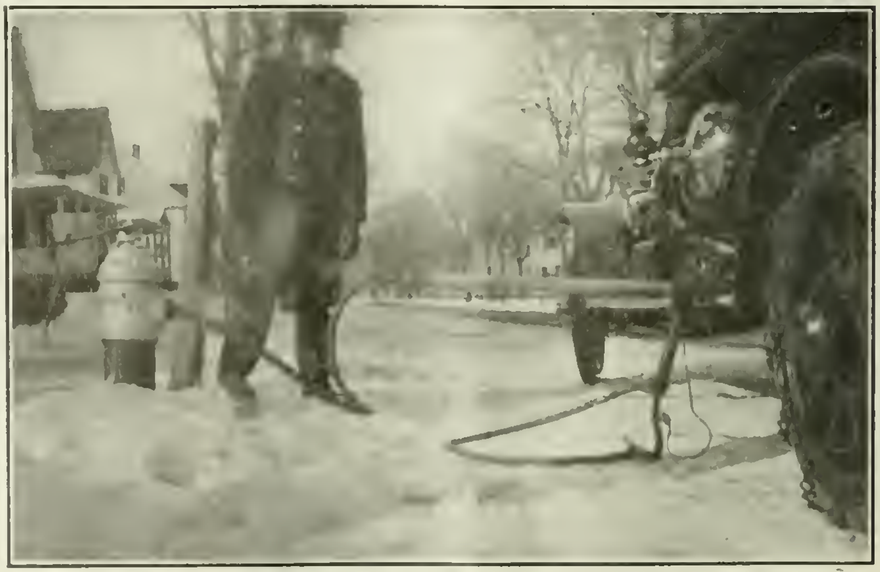
THAWING AT MIDDLETOWN, CONN.

The method employed at Middletown, Connecticut, for thawing fire hydrants is unusual, we believe, and has been described for us by the superintendent of the Water Department, Edwin T. McDowell, as follows:

The machine used was a 30 h. p., 4-cylinder Federal fire truck. The exhaust muffler was removed from the truck and the ends of same used as companion flanges to fasten a piece of 2-in. galvanized pipe about 12 in. long to the end of the cast-iron exhaust pipe. This short piece of pipe was connected (by means of a union and elbow, to insure easy removal) to another piece of 2-in. galvanized pipe about 4 ft. long, which can be plainly seen in the accompanying picture. At the end of this pipe was connected a piece of ¾-in. hose about seven or eight feet long by means of a special coupling.

The end of this hose was inserted in the hydrant to be thawed, as shown in the picture, the end being forced down the barrel until it touched the ice in same. The engine was then started and the hot exhaust carried by the hose to the frozen parts of the hydrant thawed out same in a very short time. In case the hydrant was frozen for a short distance at the bottom only, the apparatus usually thawed it in three or four minutes; but in some cases where the hydrant barrel contained a considerable amount of ice, a correspondingly longer time was required. The most stubborn case—a two-way hydrant which was entirely filled with ice from the bottom to the nozzle—required about 18 minutes.

Our apparatus for thawing water mains and services was very simple and was all mounted upon a one-ton Buick truck belonging to this department. It consisted of a 25 K. W. transformer with which we reduced the 2,300-volt A. C. current from the primary power wires in the street to about 50 volts, an instrument board upon which was mounted an ammeter to indicate the amperage being used, and a water rheostat for controlling the current. The water rheostat was home-made and consisted simply of two flat coils of heavy copper wire and a barrel filled with salt water. One terminal of the rheostat was connected with a flat coil of heavy copper wire which was laid in the bottom of the barrel. The other terminal was connected to a similar coil, which was supported by means of a vertical rod from a cross piece at the top of the barrel. By means of an adjustable thumb screw the rod supporting the upper coil could be raised or lowered and the distance between the two coils varied. In this way the resistance of the water to the electric current



THAWING FIRE HYDRANT WITH EXHAUST FROM FIRE TRUCK.

passing through it could be increased or decreased at will and the current controlled accordingly.

About 115 services and several short lengths of cast iron mains in various sizes up to 6 in. diameter were thawed by this apparatus and without a single failure. The water rheostat heated up very quickly and boiled, but this was overcome by shoveling snow into the barrel occasionally. The current used was about 350 to 400 amperes.

WATER WORKS OPERATION—DISTRIBUTION SYSTEM

Every Valve Should be Inspected After Each Use and at Regular Intervals—Points Inspection Should Cover—Defects and Remedies.

INSEPECTION AND MAINTENANCE OF VALVES.

Even more important than knowing where valves are located is having them always in serviceable condition. A valve whose location is unknown might just as well not be there; but one that is in poor condition might much better not be there, for it may be leaking and thus waste water and weaken the support of the main, or it may be closed and thus reduce the head and discharge capacity of the system during fires, or it gives a sense of security that is false and may lead to serious delays and enormous damage when an emergency demands its use. A soldier who goes on guard duty without being sure that his gun barrel is not foul and mechanism rusty runs no more risk than a water works superintendent who is uncertain as to the condition of his valves and hydrants.

He can know the condition only by inspecting them at sufficiently frequent intervals. A large percentage of superintendents report that they inspect valves once a year and hydrants more frequently, a considerable number inspect valves twice a year, and some at shorter intervals. There are altogether too many, however, who make no systematic inspection whatever.

In the first place, a valve should be inspected by a reliable and experienced man immediately after every use of it. There are several reasons for this. With very few exceptions "using" a valve means closing it. Was it opened again? It does not do to take this for granted or accept the assurance of a man who was probably excited by the emergency that called for its use. Score of instances, if not hundreds, could be cited of valves found closed when they were supposed to be open. Again, the use of the valve may have twisted, buckled or broken the stem, jammed the gate, started a leak in the stuffing box, or otherwise put the valve out of condition; and this should be learned and rectified at once. On account of the possible excitement of the superintendent himself or his assistant caused by the break in the main or other reason for closing the valve, it is a good plan to have every valve that could possibly have been used examined one or two days after the emergency has passed, when every one is calm and has time to do so thoroughly.

In addition to these special inspections, each valve should be regularly inspected at least once a year. In the North, this annual inspection should be in the fall or early winter so as to prevent, as far as possible, the necessity of making repairs when the ground is frozen and covered with snow. As the low temperature may have injuriously affected the valve or box, it is also well to make spring inspections of the valves.

Inspection should include checking up description of location of valve box; noting whether top of box is flush with street surface and vertical, whether box cover sits firmly in place and is not dislodged by wheels, and whether the box is free from all dirt and the stem nut readily reached by the key. The box should be free of water (the freezing of which in winter would seriously delay use of the valve). There should be no leakage through the stuffing box, at the bonnet or throat flange or elsewhere around the valve. The key should fit easily but securely on the stem nut and the nut be fastened securely and firmly in place. The stem should turn easily in either opening or closing the valve, and it should be ascertained that it raises the gate when supposed to be doing so.

If the top of the box is below the street surface it causes a depression objectionable to traffic, and may become covered with dirt that makes it difficult to find or get at. If it extends above the surface it is dangerous to traffic and may be damaged by it, and is liable to be pushed out of plumb unless the street has a firm pavement. If out of plumb, it is not easy and may be impossible to get the key well onto the stem nut. When embedded in a concrete pavement or pavement base, the top of the valve box is sometimes moved by expansion movement of the concrete. Appreciable movement from this cause is infrequent, however; but when it becomes considerable should be corrected by cutting out the concrete and straighening the box.

Some box covers do not seat solidly and for this or other reason can be jarred out of place by traffic. Also because they are not supported around their circumference or are too light, they are sometimes broken. If this is found to occur, a change should be made in the kind of box. A broken or displaced cover is not only a danger to traffic but permits dirt to enter the box.

Dirt in the box means something wrong, and that something should be discovered and remedied. The dirt can be removed by an iron spoon similar to but larger than those used by drillers for cleaning out drill holes in rock. Or it can be washed out by use of a garden hose attached to a hydrant or a hand pump, the discharge end of the hose being pushed down into the box and the water washing the dirt onto the street surface.

Sometimes a main is of necessity laid below groundwater level, in which case water will stand in the valve box. Apparently the only remedy here is to make a water-tight box, enclosing the pipe and rising above the water level. Such a box may be of cast iron, a sleeve at each side fitting over the pipe and the joint between the two being leaded and calked. Concrete may be used and the box cast in place, but great care is required to secure concrete that is water-tight; even slight seepage may fill a box in a few weeks or months.

Where the ground water is below the pipe, water in the box arouses suspicion that the valve leaks, and the cause of the water should be satisfactorily determined. If it comes through the stuffing box or the throat flange, it may be possible to remedy it by tightening up the follower bolts or throat flange bolts. For this purpose it is desirable to have a key that will fit these bolts so that the tightening can be done without digging down to the valve. However, the follower bolts should not be tightened so much as to make the stem work hard, and it is a good rule never to tighten them without first removing the follower and putting in new packing that gives good lubrication. Then send the follower down snug and raise and lower the gate a few times; adjusting the follower screws of the stuffing box until there is no leakage and at the same time the stem works easily.

Having an easily working stem is very important. Numbers of valves have been damaged by too much muscle applied in an attempt to open or close them. All valves should work easily and employees be instructed never to

CLEANING MAINS, LEAKAGE AND METERS (Continued).

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
Massachusetts (Continued):						
Reading	No	....	....	No	96	City
Saugus	....	....	....	No	30	Consumer
Spencer	No	....	Inspection	No	95	City
Springfield	....	....	....	....	100	Consumer
Taunton	Probably	Flushing	None	No	62	Consumer
Turners Falls	No	....	None	Yes	7	Both
Walpole	No	....	Inspection	No	80	City
Waltham	Yes	....	....	No	62	City
Wellesley	....	Not cleaned	Ventura meter	No	100	City
Weymouth	No	....	Pitometer, hose & meter	Yes[m]	50	City
Michigan:						
Albion	No	....	None	No	72	City
Alma	No	....	Leak detectors	No	95	City
Battle Creek	No	....	Inspection	No	97	City
Big Rapids	No	....	None	....	2	City
Coldwater	No	....	None	No	None	....
Crystal Falls	No	....	Telephone receiver	No	1	City
Grand Rapids	No	....	Inspection	Think not	Most	City
Hastings	....	Flushing	None	No	50[l]	Both
Highland Park	Yes	Flushing	Surface inspection	No	7	Consumer
Houghton	No	....	Aquaphone	No	100	Consumer
Iron Mountain	No	....	Listening gates and hydrants	No	45	Both
Ishpeming	No	....	....	No	95	City
Jackson	No	....	Meters	Perhaps	95	City
Manistee	Yes	Flushing	Inspection and leak locator	No	53	City
Marquette	No	....	Surface inspection	No	50	City
Mt. Clemens	No	....	Meters	....	99	City
Muskegon	....	None yet	....	No	75	....
Paw Paw	Yes	Flushing	....	No	100	Consumer
Petoskey	Yes	Flushing	None	No	75	City
South Haven	No	....	Meters	No	88	City
Traverse City	....	Flushing	....	No	50	City
Yale	....	....	Inspection	No	7	City
Ypsilanti	No	....	None	....	62	City
Minnesota:						
Eveleth	....	Flushing	None	No	2½	Consumer
Fairmont	No	....	Meters	No	100	Consumer
Lake City	No	Flushing	Sonoscope	No	100	....
Moorhead	Yes	Flushing	Darley leak locator	No	....	City
St. Paul	No	....	Inspection	No	91.2	City
Willmar	No	....	....	No	100	Consumer
Mississippi:						
Vicksburg	Not yet	....	Aquaphone, inspect. & meters	No	25 to 30	Both
Water Valley	Yes	None yet	None	No	100	City
Missouri:						
Albany	No	Flushing	None	Probably	100	Both
Boonville	Yes	Flushing	None	Think not	60	City[g]
Carrollton	Yes	By contract	....	No	95	Company
Farmington	No	....	....	No	100	Consumer
Fulton	No	....	No special method	No	50	Consumer
Trenton	No	....	Meters	No	100	City
Washington	No	....	....	....	65	Consumer
West Plains	No	....	....	No	95	Consumer
Montana:						
Billings	Yes	Not cleaned	Surface inspection	Think not	65	City
Bozeman	Yes	Flushing	....	Yes[n]	5	Consumer
Havre	No	....	Surface indications	No	20	City
Helena	No	....	None	Think not	10	City
Kalispell	Yes	Flushing	Inspection	No	80	Consumer
Libby	No	....	None	No	None	....
Livingston	No	....	Inspection	No	5.5	Company
Nebraska:						
Alliance	No	....	....	Yes	100	Consumer
Aurora	....	Never done	Surface inspection	Yes	90	Consumer
Grand Island	No	....	....	No	100	Consumer
Hastings	No	....	....	No	100	Consumer
Omaha	Yes	None cleaned	None	No	86	Consumer[o]
Schuyler	No	....	None	Think not	100	City
New Hampshire:						
Berlin	No	....	None	No	20	Company
Claremont	No	....	Meters	No	75	Company
Concord	....	Flushing	Venturi meter	No	68	City
Dover	Possibly	Not done	None	No	79.5	Both
Franklin	No	....	Listening apparatus	No	100	City
Lebanon	....	Never done	....	No	43	Both
Milford	No	....	House inspection	No	50	City
Newport	No	Flushing	Surface inspection	No	Very few	City
Rochester	No	....	Leak detector	No	72	Both
New Jersey:						
Atlantic City	Yes	Flushing	Surface inspection	No	99	City
Bridgeton	No	Never cleaned	Inspection	Think not	none	....
Dover	No	....	....	No	76	City
Hawthorne	No	....	None	No	50	City
Helmetta	No	....	Pressure gauge	No	All domestic	Company
Irvington	No	....	Inspection	No	90	....
Milltown	....	....	Meters	No	100	City
Newton	....	Flushing	None	No	70	City
Nutley	No	....	Pitometer last fall	Not now	100	Consumer
Jamesburg	....	....	None	No	30	Company
Pleasantville	No	....	None	u	60	Company
Princeton	No	....	....	No	100	Company
Rahway	No	....	Inspection	No	7	City[k]
Wallington	No	....	None yet	Think not	20	Company

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* The word "city" is used to designate municipalties of any nature or water districts; l—approximate; k—consumer owns sizes larger than ⅝ inch; u—large amount of leakage from wood pipes.

METERS. RATES. MUNICIPAL USE. (Continued)

City and state	Is deposit on meter required?	Is rental charged for meters? †	Does city obtain water without payment?	Use made of free water	Used for Municipal Purposes	
					Percentage	Is any of it metered?
Massachusetss (Continued):						
Reading	No	No	Yes	....	......	All buildings
Saugus	....	No	No	....	......	All buildings
Spencer	....	No	Yes	Schools, public buildings, flushing sewers and streets, water troughs, fire	......	No
Springfield	....	....	Yes	All city uses	4.8	17%
Taunton	....	....	Yes	All but public buildings	......	Buildings
Turners Falls	No	Yes	Yes	Sprinkling streets, buildings, fire	......	1 school
Walpole	No	No	Yes	Drinking fountains and fire	5 to 10	All buildings
Waltham	No	No[e]	Yes	Fire	......	All buildings
Wallesley	No	No	Yes	Street sprinkling and fountains	20	Schools
Weymouth	No	No	Yes	Fountains and fire	......	Schools
Michigan:						
Albion	No	Yes	Yes	Fountains and fire	5	Some schools
Alma	No	No	Yes	Street and sewer flushing	5	Schools
Battle Creek	No	Yes	Yes	Parks, fountains, streets, sewers, buildings	20	Very little
Big Rapids	No	Yes	....	.. ..	15	No
Coldwater	....	....	No	....	20	No
Crystal Falls	No	No	No	....	......	....
Grand Rapids	....	$2	No	....	......	Most
Hastings	No	Yes	Yes	Street and sewer work and parks	4	No
Highland Park	....	....	Yes	Schools and street sprinkling	......	Schools
Houghton	....	....	No	....	35	No
Iron Mountain	No	No	Yes	Schools and city buildings	10	All
Ishpeming	No	No	No	....	10	School
Jackson	Yes	No	Yes	Street uses, fountains, etc.	5 to 6	Some
Manistee	....	No	Yes	Flushing sewers, fountains, hospital		Fountains and hospital
Marquette	....	No	Yes	Fire houses and park	......	City Hall
Mt. Clemens	$3	No	Yes	Sprinkling and fires	25	Schools
Muskegon	....	$1.00	Yes	....	......	No
Paw Paw	....	....	....	....	......	....
Petoskey	No	$1.20	No	....	10	All buildings
So. Haven	No	Yes	....	....	4	All but hydrants and flush tanks
Traverse City	....	$1.00	No	....	......	....
Yale	No	Yes	No	....	......	Schools
Ypsilanti	....	$1.00	No	....	8	All
Minnesota:						
Eveleth	....	....	No	....	30	....
Fairmont	No	$1.00	Yes	Streets and sewers	30	No
Lake City	....	Yes	......	City Hall, parks, fire	17	All but flushing and fires
Moorehead	By renters	$3[f]	No	....	......	School
St. Paul	No	No	No	....	1	Very little
Willmar	....	....	Yes	Flushing sewers	10	No
Mississippi:						
Water Valley	No	No	Yes	Street sprinkling and bldgs.	20	School
Vicksburg	Yes	Yes	Yes	Flushing, fire, etc.	20	Yes
Missouri:						
Albany	No	Yes	Yes	Street flushing and fountains	5	No
Boonville	....	No	Yes	All public uses	......	Schools
Carrollton	No	Minimum charge	Yes	Sewers, street cleaning, water troughs	10	No
Farmington	....	....	No	....	......	....
Trenton	By renters	....	Yes	Sprinkling, city buildings and fire	3	Yes
Washington	No	No	Yes	Flushing streets	5	No
West Plains	....	....	Yes	Water troughs	10	No
Montana:						
Billings	Yes	No	Yes	All city uses	......	No
Bozeman	No	Minimum charge	Yes	City Hall and fire stations	13	Schools
Havre	No	Min. charge	Yes	Flushing sewers and streets, fire	10	Schools & library
Helena	$10	Yes	Yes	Irrigation and fire	......	No
Kalispell	....	....	No	....	10	Schools and sprinkling
Libby	....	....	No	....	5	No
Livingston	No	No	Yes	City buildings and sewers	......	No
Nebraska:						
Alliance	....	....	Yes	Parks, public buildings, sprinkling, flushing sewers, fountains, fire	30	No
Aurora	No	No	....	....	......	Schools
Grand Island	....	....	No	....	......	All
Hastings	....	....	Yes	Sewers, parks, fire	15	No
Omaha	....	....	No	....	5	All but flushing street and sewers
Schuyler	No	No	No	....	25	No
New Hampshire:						
Berlin	Sometimes	Yes	Yes	Flushing	......	Schools
Claremont	No	No	No	....	......	....
Concord	....	No	Yes	Municipal buildings, street watering, fire	......	No
Dover	No	Yes	No	....	......	All but street, sewers and fires
Franklin	No	No	No	....	......	....
Lebanon	No	Yes	Yes	Sprinkling streets, schools, fountains, fire	......	No
Milford	....	....	No	....	......	All
Newport	....	....	Yes	Public buildings, flushing sewers, cemeteries, fire	25	No
Rochester	No	Yes	Yes	City sprinkling and public buildings	5	No
New Jersey:						
Atlantic City	No	No	Yes	All municipal uses	......	No
Bridgeton	....	....	Yes	Flushing streets and sewers, public buildings, fires	10	No
Dover	No	No	Yes	Water trough and fire	......	No
Hawthorne	No	Yes	No	....	......	Yes

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† Amounts given are annual rentals, in some cases reported as quarterly or monthly payments; f—Monthly payments until meter is paid for.

use much strength in turning the key. A good plan is to use keys that are not strong enough to break a well-constructed valve but will twist themselves first.

Effort to open a valve already open or close one already shut may result in breaking the stem from the gate, causing the latter to keep the valve always closed. The stem may revolve, however, giving the impression that the valve is being opened and closed. This can be determined by listening for the "singing" of the water when the gate is presumably nearly shut. If there is no singing, conditions should be investigated by removing the packing plate and pulling up the stem, or by removing the bonnet. (This will of course be preceded by shutting off pressure from the valve.) If conditions of the distribution system permit, it may be possible to determine whether the gate is loose by opening a fire hydrant on the main affected by the suspected valve and closing all other gates affecting flow to this hydrant; then determining whether the suspected gate can be used to start and stop flow from the hydrant.

It should also be learned whether each gate seats so as to close the valve completely. This can generally be ascertained by listening for the singing as the gate closes, which singing will become entirely inaudible, even through an aquaphone, if the valve closes tight. If it does not close tight because of sediment in the bottom of the case, this can often be removed by opening a nearby fire hydrant and closing the valve slowly when near the bottom, causing the high velocity under the gate to flush out the sediment.

In the annual or semi-annual inspection, even if all of the tests named above meet requirements, the packing should be renewed on general principles and the gate raised and lowered until it works easily and it is certain that the stuffing box is water-tight. And there should be no question whatever that the gate is left wide open, except in the occasional cases where it is supposed to be kept closed.

CONCRETE SIDEWALKS WITHOUT CINDER BASE.

The idea of building concrete sidewalks without cinders or other materials as a base between them and the ground has been advocated by contributors to Municipal Journal, but the idea has not been generally adopted, nor on the other hand has it been abandoned. It is, therefore, a subject for discussion and one concerning which arguments pro and con are of interest. Writing to the Concrete Highway Magazine, the organ of the Portland Cement Association, M. R. Thayer, says:

One of the important engineering problems today is better sidewalk construction at less cost. Instantly the problem resolves itself into this question, "Where can a material saving be made, consistent with best results?"

It is a common practice to dig a trench in the soil, disturbing that which is already a firm, uniform base, and then fill the trench with ashes, cinders, brick bats, etc., for a so called "drainage," with no provisions whatever in most cases for an outlet.

With the coming of cement into general use the sidewalks of the country today have undergone a rapid change from timber to concrete. This has taken place without agitation on the part of any one, as concrete has adapted itself so perfectly and readily to this use.

If a cinder base must be used, permanent outlets for drainage should be provided. The best grade of clinker cinder made cannot be packed tight enough in a short time by either rolling or wetting, or both. Their corners are too rough and when they do become tight enough they will have disintegrated and shrunk, thereby causing uneven settlement. The large per cent of voids in the cinders, because of their inability to make them lay close together, due to their rough corners, hold a quantity of water, especially when placed in a trench without drainage, and during freezing weather expand by virtue of the amount of water contained in the voids.

In this case we have a slab on a base with maximum movement. Is it any wonder they fail when we consider the weakness of poorly mixed concrete and a porous base course which cannot possibly hang together and resist the subgrade gymnastics? The argument that a cinder sub-base does not prevent cracks and that dispensing with it does not increase the cracking seems to be justified.

The writer has had to do with a considerable amount of walk construction of the two-course type. No walks were wider than 6 feet, nor thicker than 4 inches. Some were placed on cinders and drained, and others were placed on earth, with but the usual drain or slope of the parking for a drain. Some were built upon tight clay soil and others upon loose timber soil. The results prove that a sub-base is not essential to construction but stability and strength are, for by having a concrete well mixed, to a proper consistency, made dense by rolling and of a one-course construction even of a larger coarse aggregate, a better walk would be obtained. When this is specified and placed directly on the earth of uniform compactness and sufficiently drained, no fear need be felt of frost action or weak base, for the action of frost, so detrimental, will have been lessened and the slab made much stronger to overcome what action the frost may have on walks 4 to 5 inches thick up to 6 feet wide, since there will be only a small amount of moisture in the soil.

NATIONAL CONFERENCE ON WAR ECONOMY.

On Wednesday and Thursday of next week, June 5th and 6th, there will be held at the Hotel Astor, New York City, a "National Conference on War Economy," under the joint auspices of the Academy of Political Science and the Bureau of Municipal Research, with the cooperation of the National Municipal League. Sessions will be held Wednesday evening and Thursday morning, afternoon and evening; in addition to which the National Municipal League will hold its annual meeting in Greenwich Village Wednesday morning and afternoon, the morning session being a joint one with the Governmental Research Conference, and the Civic Secretaries' Conference meeting with the League in the afternoon. At these sessions the League will discuss, among other topics, Federal Relations to American Municipalities, War-Time Work of Civic Organizations, What Are Necessary Municipal Improvements, and The City Manager Plan as a War Measure.

The topic of the first session will be "Executive Leadership in Democracy," at which session several governors will speak of the war work of their respective state governments. The second session will be devoted to a discussion of "War Economy in Financing Local Governments" by Charles L. Craig, comptroller of New York, Paul M. Warburg, vice-governor, Federal Reserve Board, and Andrew J. Peters, mayor of Boston. "The Government as Employer" will be the topic Thursday noon at a luncheon meeting discussed by labor leaders and government officials. Thursday afternoon the "New Era in Budgets" will be the subject of addresses by W. F. Willoughby, Arthur N. Pierson, Frank O. Lowden, Emerson C. Harrington and Prof. Howard L. McBain. On Thursday evening a joint dinner conference will be held to discuss "New Duties of City and State Governments in War Time."

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Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send to Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

MUNICIPAL YEAR BOOKS.

The Bureau of Municipal Research of Philadelphia (the purpose of which is "To promote efficient and scientific management of municipal business"), in its weekly leaflet for May 16th, publishes the following, which we commend to the attention of the officials of all cities—also to the civic associations, boards of trade, and all others interested in having citizens interest and inform themselves in city affairs:

> Nearly all cities issue some kind of annual municipal directory. These range in size from modest leaflets to lengthy volumes. They vary in contents from mere lists of officials to elaborate descriptions of the local government and its activities.
>
> The most noteworthy of these are the Municipal Year Book of the city of New York, compiled by the municipal reference librarian, the Chicago City Manual, prepared by the city statistician, and the Boston Municipal Register, compiled by the statistics department. Each explains the organization, function, and activities of the city government, and the powers, duties and salaries of the important officials. The unusual accomplishments and notable achievements of each department during the year are also given attention.
>
> Of course, there are variations in the nature of the general information included in the three year books. The New York one includes, besides the really essential information, only a few statistical tables. The Chicago Manual devotes a number of pages to local history and literature and to discussions of hot weather and sacrilegious changing of street names. The Boston Register emphasizes statistics of population, area, elections, and finance.
>
> All of the essential information of these year books has been gleaned from laws, city charters, ordinances, and reports of departments. To locate these facts quickly in the original sources is a difficult task for a specially trained person and an impossible one for the average citizen. If collected and well indexed in a handy reference book, these facts become easily accessible to every one.
>
> A plan could easily be worked out as to what facts are wanted regarding each department, bureau or other unit, or which data are important concerning given phases of municipal activity. Then uniform information, comparable statistics, and a minimum of useless material would be at the quick disposal of every official, every councilman, every citizen.

Some officials seem to take pride in the amount of matter they put into their annual report, while the real test of its value should be the amount that the readers get out of it.

This depends upon the reader as well as upon the matter, and the report should be adapted to the readers—the average citizens. Unless they can use it to keep in touch with the affairs of the city, the report is so much waste paper.

The aim in preparing these reports should be maximum of quality and minimum of quantity. Service in promoting civic interest, and not surface area of printed pages. Thousands of pages of municipal reports are printed every year that no one reads but the proofreader, and he has to be paid to do it. In the general crusade for economy, why not apply it to the saving of a few tons of paper by cutting all useless matter out of municipal reports?

MUNICIPAL ADVERTISEMENTS.

While on the subject of waste in municipal printed matter we are reminded of another medium of such waste—and again our text is taken from Philadelphia. In a copy of the "Public Ledger" of that city we find one hundred and sixteen consecutive inches—nearly ten feet—of matter like the following:

> Unique Auto Radiator Company, motor parts, etc., two hundred and seventy-eight (278) dollars and thirty-five (35) cents; Manufacturers' Supplies Company, motor supplies, one hundred and seventy-three (173) dollars and ninety-eight (98) cents; F. A. Mitchell, motor supplies, two hundred and eighty-three (283) dollars and seventy-one (71) cents; The Christensen Engineering Co., motor parts, etc., two hundred and fifteen (215) dollars and twenty (20) cents; Sterling Tire Corporation, tires, seventy-five (75) dollars and eighty-eight (88) cents; The Prest-O-Lite Company, prest-o-lites, etc., eighty (80) dollars and

This is part of a published ordinance, all but one inch of which consists of a list of expenditures made by various departments in excess of their appropriations, the ordinance making additional appropriations to pay the bills for these. We presume the law requires publication of all these items, possibly requires that each sum be stated in both figures and words, but if so it certainly defeats its own end (unless this end is keeping the newspaper business managers happy). Only the most persistent investigator would ever read such a mass of matter, and then he would set it down in figures in tabular form so that he could check up totals. If the amounts must all be published, why not publish them in tabular form thus:

Unique Auto Radiator Co.; motor parts..............	$278.35
Manufacturers' Supplies Co.; motor supplies............	173.98
F. A. Mitchell; motor supplies....................	283.71
Christensen Engineering Co.; motor parts............	215.20
Sterling Tire Corporation; tires....................	75.88
Prest-O-Lite Co.; prest-o-lites....................	80.15

In this form it would occupy about half the space and the several items could be found and the amounts totaled.

But why print even five feet of such items, approximating a thousand in number? The books of the departments are public and can be inspected by a representative of the taxpayers if there is suspicion of irregularity; and only deep suspicion would cause any one to wade through yards of such figures, even though thrust before him with his morning news.

We believe in publicity. It has been the most effective agent in raising the world out of the dark ages, and more recently in the development, in less than one generation. of a "Public be Pleased" attitude where formerly a railroad president said (and acted) "The Public be Damned." But words are said to be used by diplomats to conceal the truth rather than to tell it, and publicity may be so used as to produce the same effect, although unintentionally. We have no doubt that every item in the advertisement referred to was correct; but we question whether the readers of the "Public Ledger" even noticed that the statement was made that the several departments mentioned had exceeded their appropriations by $403,971.

Suppose a few inches of a newspaper column had been used to state the fact as follows:

CITY EXPENDITURES IN EXCESS OF APPROPRIATIONS.

City Councils have passed and the mayor has signed an ordinance appropriating $403,971.59 to pay bills incurred by city departments in excess of previous appropriations. The amounts of such excess expenditures by the several departments are as follows:

Department of Public Safety	$8,468.05
Department of Public Works	43,524.78
Department of Public Health and Charities	24,279.34
Department of Supplies	212,791.84
Mayor	1,412.40
County Commissioners	108,314.19
Coroner	237.18
Receiver of Taxes	508.47
City Treasurer	4,335,34
Total	$403,971.59

About 800 items are included in these expenditures. These have been tabulated and the tabulation may be consulted by interested taxpayers at the office of the City Treasurer.

That would perhaps give publicity to the matter. The advertisement referred to was publication but not publicity. Paying for it was a waste of the public money for which there is no excuse except that the law requires it, and for the law itself there is no excuse.

ENGINEERING STUDENTS ALSO SERVE.

A general withholds reserves from a battle until the last extremity, for, if absence of them should cause no other calamity, it may prevent him from reaping the fruit of victory. Irksome as the waiting is to them, the reserves are as necessary and important a part of the army as those in the front ranks. "They also serve who only stand and wait."

Fortunately, the United States has largely avoided England's mistake in using as fighters her engineers and other skilled and learned men who could have served their country much better by performing the work for which they were trained. But we are using them—are sending them "over there" by the thousands; and very many of them will never come back. In England and in France the loss of engineers will have been far greater than in this country before the war is ended.

On the other hand, the demands for engineers after the war will be greater than ever before. They will be needed for rebuilding roads, changing munition factories to serve peaceful purposes, rebuilding Belgium and northern France in almost every detail; while Russia and China will be seeking their aid in securing all the modern improvements of civilization. If the men are not then available for carrying on this work, it will greatly delay the reconstruction and the reaping of the full fruits of victory.

The necessity now is to win the war, but even the importance of this should not prevent us from exercising foresight and preparedness for peace. Engineers must be had. Where will they come from? Must we delay development while we are educating them, or will we have them in reserve like a wise general? There can be no question as to the proper course. Technical schools, instead of reducing their teaching capacities, should double them, and there should be a supply of students that would use to the utmost these increased facilities. A young man with a talent for engineering could serve his country better by acquiring a technical education than by fighting. When that education has been acquired, if the war still continues, he will be far better prepared to aid his country in the prosecution of it, while others take his place at the schools. If the war shall have ended, he still can aid his country in recovering from its wounds and ravages, and this service will be no less important than the other.

Engineering schools should not be made asylums for slackers—good engineers are not slackers, and slackers will not make good engineers. But the draft boards should permit earnest students to complete their courses (they constitute but a fraction of one per cent of the total draft). And let us persuade young men who have engineering talents to resist the patriotic impulse that calls them to the battlefield and start at home preparing for a more important service, or finish such preparation if they have begun it. Let us put it to them as a matter of patriotism that they should assist in maintaining a reserve of able engineers, and that by enlisting for such reserve, if they do it in a spirit of patriotism, not less than those who enlist for duty in France do they also serve.

THE A. W. W. A. CONVENTION

Continuation of Description of Thirty-eighth Annual Convention—Discussions on Superintendents' Day—Experiences with Frozen Services.

Reported by CHARLES CARROLL BROWN.

The peculiar conditions accompanying the treatment of water at Council Grove, Kan., described in the paper by L. L. Tribus, were shown to be common to the cities and towns on the Neosho river, in the discussion by C. C. Young, director of the Laboratory of the Kansas State Board of Health. Colloidal clay in suspension in the river water at certain stages of floods carries aluminum sulphate and the addition of more seems to have little or no effect in coagulation, whereas under more usual stages of river flow the chemical has its usual effect. Another difficulty is that the sand in the filters sometimes turns black, and the usual washing will not whiten it. The efficiency of filtration seems not to be interfered with. The discoloration seems to be due to deposit of manganese and iron from the water on the sand and the growth of certain algae. Some natural sands from the same vicinity show the same discoloration. The small plants run about 6 hours and rest 18 hours, without washing, and the stagnation increases the discoloration. The only effect of the discoloration is to show to the eye that the filter is not properly operated. The eight plants along the river have several methods of washing, several varieties of filters and methods of correct operation.

The paper on the "Practicability of Adopting Standards of Quality for Water Supplies," read by Abel Wolman Wednesday evening, was rather negative in its attitude. The U. S. Treasury standard was taken as the text and its inefficiencies and inaccuracies were shown in considerable detail. However, the reasons for many of them were as clearly shown and the argument appeared to be that if standard methods of analysis and of mathematical interpretation were adopted there would be more chance for the fixing of standards of quality. Since the Treasury standard does not fix methods of analysis and interpretation definitely, it lies open to all the large variations due to the differences in methods, and so waters reported on by one analyst may be accepted whereas much better water examined by the methods of another may be rejected. To one who aided in the first applications of bacteriological analysis to the waters of streams, the arguments and statements regarding necessity of standards of manipulation and analysis were very familiar, although first made nearly thirty years ago when knowledge of the subject was far less extensive, though apparently not much less definite so far as it went. The discussion further emphasized the differences in systems, in water to be treated, in methods of operation, in methods of analysis and in methods of interpreting results, as well as in the purity required and the necessity of co-operation and of co-ordination of work in all these lines as well as differentiation of standards to meet the variations in requirements.

Thursday was superintendents day and the "school" was left to carry on its debating society without the aid of the instructors. The principal subjects were the severe weather of 1917-8 and its effect on service pipes, mains, hydrants and consumption in the forenoon and office records in the afternoon. No papers were scheduled on the program but a number of short papers were read, from which the following data were gleaned without close attention to who made the report.

A. W. Cuddeback, engineer and superintendent of the Passaic Water Co., Paterson, N. J.; W. H. Randall, superintendent of water maintenance, Toronto, Ont.; R. C. Wheeler, Philadelphia, Pa.; W. E. Miller, Madison, Wis.; D. R. Gwinn, Terre Haute, Ind.; H. Hymmen, Kitchener, Ont.; A. Bugbee, Trenton, N. J.; Wm. Luscombe, Heat, Light & Water Co., Gary, Ind.; Chas. A. Windholz, Syracuse, N. Y.; C. E. Bolling, Richmond, Va.; J. M. Diven, Troy, N. Y.; W. A. Judd, Mason City, Iowa; R. F. Johnson, Saginaw, Mich.; L. B. Landmann, Jefferson City, Mo.; F. E. Kingsbury, St. Louis, Mo.; W. H. Henby, St. Louis County, Mo.; J. A. Jensen, Minneapolis, Minn.; H. P. Bohmann, Milwaukee, Wis., contributed to the supply of data.

As to increased consumption on account of the cold weather last winter, most of the plants reported February as the month of maximum consumption instead of the usual August. The only exceptions were Montclair and another city, which are wholly metered, and in these cases the consumption in February was enough larger than usual to approach closely the August maximum.

In Paterson a comparison for several years showed a point of maximum in February except this year when December, 1917 and February, 1918 were the same as February, 1917, and January, 1918 was appreciably higher. This maximum exceeds the previous maximum daily average consumption for the month by 61 per cent. The system is 65 per cent metered, including all manufacturing plants, saloons, dwellings with more than two families and all new services put in since 1900. A comparison of the curves showing average daily consumption for the month and average temperature for the month shows that the former follows the latter very generally, though not always parallel, and about 24 hours later. The filter capacity being about 80 per cent of the maximum draft required, some sterilized river water was admitted. Part of the district supplied by the plant had outbreaks of intestinal troubles and part had none, while other neighboring districts and others in New Jersey not supplied had the troubles, so that it was decided that the water supply was not responsible. The maximum draft for any day was on January 3, 1918. The capacity of the plant is being increased 30 per cent to meet the next similar call.

In St. Louis in 1917 the average daily consumption of water was 92,000,000 gal. with 570 miles of streets sprinkled five or six times a day, street flushing at night and lawn sprinkling. The maximum of 133,900,000 gal. was reached June 26. On January 12, 1918, the coldest day, 17 deg. below zero, the consumption was 156,500,000, about 70 per cent in excess of the yearly average for 1917. The average consumption for the 6 weeks, Dec. 28 to Feb. 8, was 126,400,000 gal. per day; nearly equal for each of the 43 days to the previous single day maximum of June 26, 1917. The excess for this 43 days over the normal average, at $40 a million gallons, is worth $60,000, requiring 65 tons of coal a day more than the usual average. This great waste was admittedly due to letting water run to prevent freezing, though every house is required to have a cut-off and drain inside the house so that the water can be turned off for the night or when the house is not occupied or otherwise liable to freeze.

In St. Louis County, Mo., 15 per cent more water was pumped during the 90 days after Dec. 15 on account of letting water run to save meters freezing. The maximum was 35 per cent above normal. If water used by manufacturers is omitted, the excess was 50 per cent.

FROZEN SERVICES.

The data regarding freezing of services and mains and methods and cost of thawing were quite extensive. In Paterson 1,000 service pipes and 50 or 60 hydrants and hydrant branches froze, but no mains. At first they were thawed by using hot water or steam, but the calls were too numerous and a truck was equipped with a gasoline engine and electric generator with capacity of 300 amperes at 20 to 30 volts. This was worked with six men and a Ford runabout attendant in two 8-hour shifts, 8 to 12 services being handled by each shift. The work was helped out by a private storage battery outfit on a Ford truck. A ¾-in. service pipe required 30 to 40 minutes and an encrusted pipe 30 to 90 minutes after connections were made. Pipes without the lead pipe goose-neck thawed more easily than those with one. The generator outfit was faster than the storage battery. There is great danger of freezing immediately after a pipe has been thawed. Water should be let run slightly until danger is past.

Toronto found that stop-cocks were useless after freezing, and services below frost line must be dug up and reconstructed. About 500 services froze, but no mains.

Auburn, N. Y., had no difficulty where inverted type of cocks was used.

In Peterboro, Ont., 200 services were frozen and required 5 to 10 min. time to thaw by electricity after connections were made.

Trenton, N. J., had 2,000 services frozen and used the electric process, with a 500 amp. generator at 10 volts geared to the truck axle. Services are 4 ft .deep and all trouble was in sand and gravel, none in clay soil.

Little Rock had seven 6-in. services to automatic sprinkler systems frozen, and possibly others were not discovered because no water was drawn through them.

Gary, Ind., with 70 miles of mains and 600 services and 4.5 ft. of frost, had no freezing.

(To be concluded.)

The WEEK'S NEWS

Status of Indiana State Highway Department—Work Planned on Lincoln Highway—Constructing Sewers by Day Labor in Spokane—Water Ownership Tangle in New York City—Federal Loan to Power Company—Merge Niagara Falls Power Plants—Vice Elimination in Cincinnati—Federal Board Approves Milwaukee Improvements —Garbage Disposal in Washington—Proposed Zone Plan for Illinois Cities—Housing Plans of U. S. Shipping Board.

ROADS AND PAVEMENTS

Stop Highway Work After Court Decision.

Indianapolis, Ind.—Following the decision of Judge Cloe, of the Hamilton county circuit court, at Nobbsville, that the law creating the state highway department is unconstitutional, engineering work has been stopped in the department. The case is to go before the state supreme court and a final verdict will probably not be reached until fall. The whole status of the work of the department being in question, the officials have decided to stop planning work. Almost the whole engineering staff, numbering about forty engineers and draftsmen, has been discharged.

Estimates of Work on Lincoln Highway.

Detroit, Mich.—H. C. Ostermann, field secretary of the Lincoln Highway Association, has announced that in spite of labor shortage, high cost of material and other retarding influences, more work is to be completed upon the Lincoln Highway in 1918 than ever before. Estimates indicate that between five and six million dollars will be spent in improvements upon the route from the Pennsylvania-Ohio line to the Pacific Coast. Roughly these expenditures are to be divided among the states as follows:

Ohio	$1,420,000
Indiana	425,000
Illinois	1,745,000
Iowa	500,000
Nebraska	105,000
Utah	290,000
Nevada	158,000
California	140,000

Permanent all-weather construction will absorb $3,920,000 of this amount, the sections of road so constructed will be mainly brick and concrete, with a small percentage of macadam. Graveling, grading and bridge work will take $858,000, while maintenance of the dirt sections of the Lincoln Highway, such as grading, draining and dragging, in the mid-western states of Iowa, Nebraska, Wyoming and Nevada, will cost $500,000 in addition at a conservative estimate.

Try to End County Road Bond Litigation.

St. Louis, Mo.—Prosecuting attorney Ralph of St. Louis county has filed in the United States Supreme Court a motion to dismiss the appeal of Thomas K. Skinker and L. Cass Miller in the St. Louis County road improvement case and end the litigation which has for three years prevented the expenditure of the $3,000,000 bond issue voted by the people of the county. If the motion is successful the county officials will try to sell the bonds. There is doubt, however, whether they can be sold now. In 1915 they were in demand and could have been sold at a premium It is probable that, even if they can be sold, there will be a loss of many thousands of dollars in premiums. In addition, the $3,000,000, on account of the increased cost of material, will hardly build more than one-half of the mileage contemplated in 1915. The appeal will be attacked on the ground that it is frivolous and it will be pointed out that prior to the institution of the suit and while the appeal has been pending there have been decisions of the Missouri Supreme Court adverse to claims made by the appellants. Skinker's main contention was that the bond issue was void because none of the proceeds from road bonds could be used in the improvement of those parts of a public road lying within the limits of an incorporated town. The Missouri Supreme Court in two decisions has held that the term road applies to city streets as well as rural roads. Skinker, following the decision of the state supreme court in the St. Louis county case, raised the identical question in the United States district court, and on an adverse decision carried the case to the United States Supreme Court. In the motion attention is called to the fact that the United States Supreme Court, in a long line of decisions, has adopted the construction of a state statute placed upon it by the supreme court of the state. The motion urges that a public enterprise like the improvement of public roads should not be further delayed by an appeal declared to be so frivolous as to suggest an abuse of the right of appeal. A plan devised by bond experts for avoiding delay by issuing refunding bonds was frustrated by the refusal of the St. Louis county court to authorize the issuance of the refunding bonds. Jefferson county and Wayne county, however, confronted by the same situation, have issued refunding bonds and proceeded with the work of road construction, and the supreme court has decided that the refunding bond plan is legal.

SEWERAGE AND SANITATION

Declares Town Insanitary; Forbids Soldiers' Visits.

Wrightstown, N. J.—Continued failure of the authorities and citizens of Wrightstown to make the town sanitary has resulted in Major Gen. Scott issuing an order forbidding officers and enlisted men to enter the town. The town has been frequented daily by thousands of soldiers and visitors, and the new stores and other business establishments which have sprung up to cater to these crowds represent investments of more than $500,000. Major Gen. Scott explained that the order had been issued only after repeated failures of sanitary officers to get Wrightstown citizens to improve the town. The need for improvements, he said, had been called to their attention in February. The ban would be lifted, he added, only when the demands of the sanitary corps are met.

City's Day Labor Does Well on Sewer Construction.

Spokane, Wash.—City engineer Butler, foreman Yake and commissioner of public works Funk, have reported that all five of the new sewers in the Fourth Ward sewer District No. 5 have been completed by the department under the day labor plan at a cost of only $54.89 over the city engineer's total estimate. These five sewers, built by the public works department at an aggregate cost of $16,453.58, were ordered constructed under the day labor plan last October after calls for bids brought a response from only one contracting firm, which bid on only two of the sewers. In doing the work for itself the city was able to take care of the winter unemployment problem without difficulty, a hundred and twenty men having been given work right through the winter and the city paying them wages amounting to $11,123.33, which city engineer Butler reminded the council was just about the amount which the city council appropriated in 1915 to care for the unemployed. Two of the jobs, done in good weather, were completed far below the engineer's estimate in spite of the fact that the city, with its war bonus system, paid its common laborers $3.50 a day compared with the $3 wage scale prescribed by ordinance, which a private contractor would have been permitted to use. This difference alone made the jobs cost the city $1,250 more for its common laborers than a contractor would have been compelled to pay with a similar number of men employed. Heikkila, Miller & Paulson was the one contracting firm which submitted bids on sewers in this group last fall. It bid on what are known as sewer No. 2 and sewer No. 5. Sewer No. 2 was built by day labor for $3,663.56. This was $87.82 above the estimate and $97.82 above the contractor's bid. The cost of sewer No. 5 was $2,241.38, which was $123.20 under the engineer's estimate and $71.20 under the bid made by the contractors. Sewer No. 4 cost, by day labor, $3,939.25, which was $143.52 under the estimate. The cost of sewers Nos. 1 and 3 both went over the city engineer's estimate. Sewer No. 1 cost $1,872.95, or $39.56 above the estimate; while sewer No. 3 cost $4,736.44, or $174.23 above the engineer's estimate. During the process of the work connections with the sewer were made for twenty-six homes at actual cost, plus 10 per cent. City engineer Butler, in his report, in part says: "Credit is also due to the foreman and workmen on the job for the splendid manner in which they carried on the work. While union and non-union men and men of many different nationalities were employed there was no friction or labor trouble of any kind. They all took great interest in making as good a showing as they could, which alone made it possible for the work to be done in such a business-like manner with such good results."

Anti-Malaria Work in War Industries Center.

Philadelphia, Pa.—As a result of recent engineering and public health conferences conducted jointly by the state department of health of Pennsylvania, the city department of health, the department of public works, United States Naval authorities, the Emergency Fleet Corporation and the Westinghouse Corporation, engineering plans have been completed for draining all marsh land and eliminating all mosquito breeding places by ditching and pumping and treating with oil and larvicide that section of Delaware and Philadelphia counties adjacent to the great war industries on the Delaware and Schuylkill rivers. Governor Brumbaugh and other members of the special Commission on Public Safety and Defense, gave to the state department of health $75,000 of the special $2,000,000 war fund appropriated by the last legislature. Lieutenant governor McClain and adjutant general Beary will keep in immediate touch with the health department in the expenditure of this fund. The action on the part of the Commission on Defense was taken to keep the night shifts of labor in these great war industries and at the same time protect the hundred thousand laborers from malarial infection. The cost of the work will approximate $215,000 and will be shared by all agencies joining in the conference.

WATER SUPPLY

City and Company Send Bills for Same Water.

New York, N. Y.—A dilemma is confronting the 3,000 and more householders in the McKinley Park and adjacent sections of Brooklyn. They have received bills for the same water from the water company and from the city and each demands payment and makes threats. These homes are being supplied with city water through the mains of the Blythebourne Water Company. Most of them, according to the city officials, are answering by paying the city's water bills. A good number, according to the Blythebourne concern, are paying the company's bills. The city officials assert it is a serious situation. The Department of Water Supply, Gas and Electricity has notified the persons affected that if they do not pay the bills presented by the city the supply of water for their homes will be shut off. On the other hand, the company sent out an official notice to all its customers, advising them the city has no right to demand or enforce payment and will not attempt to cut off water for which the company has been paid, and furthermore asserting: "This company alone has the right to receive payment for water supplied through its mains." It is not improbable, according to deputy commissioner C. M. Sheehan of the department of water supply in Brooklyn, that householders having Blythebourne mains will have the water shut off if they fail to pay the city's bills. He said, however, that the city may let the matter stand, but will charge up its water bills as a lien against the property concerned. "The city, under the law, has a lien against property where water bills are not paid," said Mr. Sheehan. "It means to enforce that lien in this instance. We have stood enough nonsense from the company. It is seeking to collect payment for water which it has not furnished and which it could not possibly furnish. We do not intend that the city is to go unpaid. The Blythebourne company has previously had city water in its mains and the city has never received a cent for it. The city got judgment against the company for $25,068.40 in the Supreme Court nearly two years ago. It hasn't yet collected on the judgment." The bills about which the present controversy centers were submitted by the city as of May 1. The bills are for water for the eight months from that date. The company's bills were similarly presented, but covered the year beginning May 1. The city of New York has been supplying water through the mains of the Blythebourne concern since last November. The then general manager of the company, Henry A. Frey, notified the city that it would be forced to suspend on November 22, because of the high price of coal and other difficulties. The Blythebourne Company formerly had a general office which is now closed, and even the telephone has been discontinued. An inspector of the company said: "There is no reason why customers should not pay our bills. They are using city water, it is true, but our pipes supply the water, and every drop of water that comes into our mains from the city is carefully metered. The arrangement is that we pay the city for the water."

Increase Water Rates for Large Consumers.

Watertown, N. Y.—A new schedule of water rates is soon to be made effective in this city. The water, light and power board special committee on rates has reported and was voted authority to carry out the schedule suggested and to seek its approval by the common council. The new schedule does not increase the cost of water to the domestic consumer or the small users, but those who use large amounts and who have been paying a very low rate will be called upon to pay more for every gallon used. The increase applies to those using in excess of 61,000 gallons. The lowest rate on the new schedule will be three cents per 100 feet—raised from 2¼ cents. This will apply to those using to exceed 110,100 feet. The next lower class formerly paying three cents, will pay 3½ cents. The board has found that with the cost of labor and filtering materials almost doubled, and figuring on an investment of $800,000, it costs three cents per 100 feet to furnish filtered water. This new rate will be temporary, for it was said by commissioner H. E. Harmon of the committee that it may be found necessary to make another advance in about twelve months.

Water Supply Improvements in Pennsylvania.

Harrisburg, Pa.—During the month of April the state health department issued decrees and permits regarding water works improvements as follows: Ambler (Ambler Spring Water Co.), approving existing water works and requiring plans for germicidal apparatus; Coatesville, approving the use of additional filter units in connection with the public water supply; Rimersburg, approving a drilled well as an additional source of water supply for the municipal water works; Birdsboro (Birdsboro Water Co.), approving plans for improvements comprising changes at Indian Run reservoir, additional pumping unit, sedimentation basins and germicide apparatus; Patton (Patton Water Co.), approving plans for improvements to the water works comprising installation of new pumping units, coagulant and chemical apparatus and baffles in reservoir; Sewickley, approving plans for germicide apparatus for installation in connection with the municipal water supply; Shickshinny (Shickshinny Water Co.), decree requiring immediate improvements to the water works including plans for filtration plant; Springfield Cons. W. Co., decree requiring submission of plans for extension of the several filtration plants; West Chester, decree requiring improvement of the public water supply including plans for filtration plant.

STREET LIGHTING AND POWER

First Government Loan to Power Company.

Washington, D. C.—Directors of the War Finance Corporation have approved the first loan to be made under the authority conferred upon them by the act approved April 5, 1918. The loan, which was authorized after a hearing of representatives of those interested, is for $1,000,000, and will run for two years. It will be made under section 7 of the act through two large banking institutions on the Pacific Coast to the Northwestern Electric Company. The loan will be made on the notes of the bank secured by first mortgage bonds of the company, supported by other collateral in accordance with the requirements of the act. The additional power to be generated through the extensions and enlarged operations of the electric company will be used in connection with shipbuilding. This loan being made through banks, the rate was fixed at 6 per cent. per annum.

Rates Raised While Case Is Pending.

Fremont, Neb.—Announcement of a raise of 25 cents 1,000 feet in the price of gas has been made by the Fremont Gas, Electric Light & Power company here. Six weeks before the company asked permission of the city council to make the increase. The council has had the matter under consideration, but no definite action has been taken. A committee was appointed to investigate records of the gas company. About a year ago the council passed an ordinance providing for a cut of 15 cents 1,000 feet or from $1.50 to $1.35. The gas company went to the courts and the case is now pending in the United States court at Omaha. The new rate will be $2 per 1,000 feet with a rebate of 25 cents if the bill is paid by the tenth of the month.

Water Power Companies Merged Against City's Opposition.

Niagara Falls, N. Y.—The Thompson bills, authorizing the consolidation of the Cliff Electrical Distributing Company, the Niagara Falls Power Company and the Hydraulic Power Company of Niagara Falls, approval of which was advocated by Secretary of War Baker, were recently signed by governor Whitman. The object of the enabling acts is to permit the proposed new consolidated company to use the Niagara water power more efficiently. Representatives of the cities of Buffalo and Tonawanda, the Buffalo Chamber of Commerce and of power and irrigation companies operating along the Niagara river appeared before governor Whitman to oppose the bills. Mayor Buck and corporation counsel Rann of Buffalo said they were instructed by unanimous vote of the Buffalo city council to oppose the legislation. Mayor Buck declared that the legislation was not necessary, and advised that "under a plea of emergency something should not be done that would result in lasting damage to our city." Governor Whitman read two letters he had received from war department officials regarding the enactment of the measures as necessary war legislation for increasing the output of munitions plants at Niagara Falls. The power increase is said to be 170,000 horsepower. The mayor of Niagara Falls and federal power administrator Bulkley spoke for the bills. Buffalo objected for the following reasons:

> [illegible] That the consolidation desired can be effected quickly [illegible] approval of the public service commission of the second district without this legislation.
>
> [illegible] if that were not so, we know of no reason why the federal government could not exert its power to commandeer [illegible] properties pending the war, and see to their [illegible] and efficient administration.
>
> It seems to us that the representatives of the war department [illegible] under a misapprehension in urging the approval [illegible] which we feel would work serious hardship [illegible] Buffalo and its people for an indefinite [illegible] present war shall have been ended. The first [illegible] authorizes the consolidation of these companies 'notwithstanding the requirements of any other law into a single new corporation, in the matter and 'with the effect specified, in respect of consolidations, in the business corporations law.' A subsequent clause authorizes the consolidated company to issue shares, the par value of which shall not exceed but may equal the aggregate of the outstanding capital stock and the surplus, unimpaired reserves and undivided profits of said corporations so consolidated 'as shown by their report and books.'
>
> "It seems to us that the subsequent provisions of this bill, requiring the approval of the public service commission of the second district and placing the consolidated company under the supervision and control of that commission, so far as the public services to be performed and rendered by the consolidated corporation are concerned, have the effect of limiting the jurisdiction of that commission rather than extending it or preserving it unimpaired, and we are extremely apprehensive that the state will lose by the approval of these bills the power to regulate the capitalization of the proposed consolidated company and the rates to be charged by it."

Work was started immediately on the improvements. The hydraulic company's forebay will be considerably enlarged. The new tunnel will extend from well out in the river to the forebay, discharging the water there. The tunnel will be built in the rock under the Hydraulic canal. The tunnel will operate on the syphon principle. The entire face of the country along the north side of the canal basin will be changed by the enlargement of the forebay. A number of old buildings in that vicinity will be replaced by modern structures. The amalgamated companies will have a new office building. Representatives of the companies agreed to a stipulation proposed by representatives of Buffalo that power in excess of the amount commandeered by the government for the period of the war and power generated after the war should be controlled in distribution by the public service commission.

Council Allows Rate Increase.

Hancock, Mich.—The city council has passed an ordinance granting the Michigan Gas & Electric company permission to charge users of gas $1.40 per thousand net, or an increase of twenty cents. The question has been up before the Houghton and Hancock councils for some time, and considerable opposition was shown. It is expected that the Houghton council will grant the company an increase in rates in Houghton also.

FIRE AND POLICE

Voters Approve Increased Pay for Firemen and Police.

San Jose, Cal.—By a vote of 4079 to 1846 the voters have approved the plea of the firemen to have their pay increased from $80 to $100. A newspaper advertisement used in their campaign was reproduced in a recent issue in these pages. At the same referendum the police won an increase in salary by a vote of 3521 to 2201. A proposal to increase the tax rate was defeated by 3871 to 1880.

Training Station at City University Bars Vice.

Cincinnati, O.—As a result of the recent establishment of the new military training station at the university the city of Cincinnati throughout its entire area is now definitely subject to the rule and regulation that no house of ill-fame is allowed to exist anywhere within the municipal bounds. The whole "restricted district" must go. The penalty for violation is a fine of not more than $1,000 or imprisonment for not more than two years, or both fine and imprisonment. Authority for the action proposed is found in section 13 of the Selective Service Regulations defining the conditions that must prevail in and around military camps and training stations and the powers conferred on military and other officials for making the regulations effective. The area barred against disreputable houses is specifically any and all places within the five-mile distance in the case of a training station. From the location of Ft. Thomas, the university station and every spot within the city's corporate limits, it is stated, will be found to lie within the barred area. Prohibition advocates made a first move in an effort to have government authorities declare the station a "military camp," which would be ground for closing up all liquor dispensaries in the district within a half mile. Some of the movers thought this rule also would catch breweries located in the same area and were urgent for action on that account. It was found, however, that the government's military regulations distinguish between "camps" and "training stations." Under the interpretation given, Camp Sherman and the Dayton aviation grounds are designated as the only "camps" in Ohio, and it was on that account that the dry workers failed in efforts to have the university station classed as a camp. In determining to enforce the entire elimination of restricted districts from the city federal officials here acted on their own initiative. Not only do the penalties apply to the persons who personally maintain disreputable houses and are responsible for their operation, but also apply to all others who, as patrons or solicitors, are found guilty of contributing to the maintenance of these offending resorts within the five-mile barred area. Proceedings under the rule are conducted by the agents of the Department of Justice, backed up by the deputy marshals and directed by those officials who are charged specially with carrying out the military regulations.

Town Almost Destroyed by Fire.

Fulton, S. D.—The town of Fulton, seven miles southwest of Alexandria, was practically wiped out of existence by fire. The total loss will be $109,000 to $250,000. The fire started soon after 3 o'clock, and because of a high wind that was blowing at the time and because there was not sufficient water available and no modern fire fighting equipment, practically burned itself out by 6 o'clock. Assistance of nearby towns was called, and automobiles carrying 200 men and equipment from Alexandria went to the scene, but could do little to prevent the speed of the flames. Farmers from a wide territory came in and rendered what assistance was possible. The fire originated in the roof of the depot, a spark from a passing freight engine being blamed. The depot was located at the south end of the business street. From it the flames, driven by a high south wind, quickly spread to the business section of the town, which, with but one or two exceptions, was wiped out along with a number of dwellings. No one was injured.

Fireman Killed in Big Shipyards Blaze.

Vancouver, B. C.—The building of steel ships in Vancouver received a severe set-back as a result of a fire which destroyed a large portion of the plant of J. Coughlan & Sons on False Creek. Robert Cameron, a fireman from No. 12 Hall, was killed by a falling wall. Damage was done to an estimated extent of between $1,500,000 and $1,750,000, and more than half of the company's 2,800 employees were out of work. Reconstruction of the plant will need months of time. The works had four ship ways, two of which, with keels laid, are entirely intact. No. 3 way, with the "War Charger" under construction, was partially destroyed, and the "War Charger" was subjected to tremendous heat, which warped some of her plates and caused other damage; but the damage to this ship is not beyond repair. On the next way was the "War Chariot," 75 per cent. plated, which is a total loss. The supporting piles burned through, the foundations gave way and the ship settled down in the mud with her back broken. Salvage operations would be very expensive. The fire started in the boiler room, and gained great headway when the acetylene plant used for welding exploded. The entire fire fighting equipment of the city turned out, but the men were handicapped greatly by the lack of a fire boat. The blaze was very spectacular, and although it started about 2:30 a. m. there was soon a great crowd of spectators. As the fire spread and there was danger of the two ships falling victims where they were moored for being fitted out volunteers took them in tow with tugs and motor boats and hauled them into the stream to safety. Fireman Cameron was killed by a falling wall of the boiler shop. He was with several other firemen when the walls started to sway. Other firemen received minor injuries. By 4:30 a. m. the fire was under control.

GOVERNMENT AND FINANCE

No Bidders for Bond Issue.

Buffalo, N. Y.—No bidders appeared at the recent scheduled sale of $1,470,000 worth of city bonds at 4½ per cent. interest. The charter provides that the bonds may be sold at private sale at not less than par and accrued interest. Councilman Heald, of the department of finances and accounts, will endeavor to interest local banks in the issue. This is the third time this year that no bids have been received for city bonds. The bonds offered for sale included: For Hamburg turnpike improvements, $45,000; $230,000, grade crossing repairs; $100,000, Bird Island pier improvement work; $50,000, turning basin bonds; $150,000, Buffalo river improvement bonds; $200,000, trunk sewer bonds; $380,000, school bonds; $30,000 park bonds; $60,000, underground police and fire-alarm bonds, and $225,000 in water bonds.

Councilmen Sentenced for Bribery.

Youngstown, O.—William F. Davis and William F. Mehlo, members of the Youngstown city council, recently convicted in the Mahoning county common pleas court of accepting a bribe for their support of a proposed municipal ordinance, have been given indeterminate sentences of from one to ten years in the state penitentiary and ordered removed from office. The sentenced men were denied new trials by the court. Both gave notice of appeal to the court of appeals and will be granted their liberty until decision is handed down. Five councilmen—Hugh Best, David Shermer, Harry Hogue, D. J. Morgan and F. P. Galvin—indicted, like Mehlo and Davis, on charges of soliciting and accepting bribes, are yet to be tried.

Capital Issues Committee Allows Improvements.

Milwaukee, Wis.—City comptroller Louis M. Kotecki has received work from the capital issues committee of the federal reserve board at Washington permitting the issuance and sale of bonds by the city for certain purposes. The amount of the issues which are endorsed is $1,050,000, while action was deferred upon issues amounting to $1,420,000 by the board. The requests which have been so far favorably passed upon by the board, with the amount of the reductions ordered in the individual issues by the board, are as follows:

	Amount Allowed.	Amount Requested.
Sewer	$200,000	$350,000
Harbor improvements	150,000	350,000
Sixteenth street viaduct	200,000	200,000
Lake Shore drive	200,000	300,000
Park improvements	50,000	150,000
Hospitals	50,000	50,000
Schools	200,000	500,000
Total	$1,050,000	$1,900,000

These bonds are all which have so far been allowed by the board on requests for the issuance of bonds amounting originally to $5,700,000, although there was a decided reduction in these requests at the hearing on the question. The requests still pending are as follows: State street bridge, $150,000; North avenue viaduct, $200,000; municipal lighting, $500,000; Central police station, $250,000; bath houses, $70,000. Total, $1,170,000. Of the bond issues allowed the $200,000 issue of sewer bonds is to take care of the extension of sanitary sewers into districts of the city that are without facilities at the present time. The $150,000 permanent harbor improvement bonds will complete the rubble mound north of the harbor to Wisconsin street and also care for the urgent repairs of docks at street ends and other inner harbor work that is imperative. The $200,000 Sixteenth street viaduct bonds are for the replacing of the section of the viaduct, which is so seriously injured by gases from locomotives that the commissioner of public works recently had to stop the passage of interurban cars over this viaduct. The $200,000 Lake Shore drive bonds are estimated to be sufficient to care for the urgent need on the south shore at the end of Oklahoma avenue, where the land is rapidly washing into the lake. The other $100,-

[illegible], not being so urgent, was disallowed. The $50,000 park improvement bonds will care for the construction of the building to contain toilets for Washington park zoo and the shelter house in Lincoln park.

STREET CLEANING AND REFUSE DISPOSAL

City to Operate Garbage Disposal Plants.

New York, N. Y.—The city has made arrangements to operate until June 15 and possibly until July 1 the three garbage disposal plants of the Dailey & Ivins Company. The firm went into the hands of receivers on March 2, and it was found impossible to carry on the contract with the city. Mayor Hylan, corporation counsel Burr, street cleaning commissioner MacStay and controller Craig discussed the matter, and judge Hand of the federal district court sanctioned the agreement. The company has three plants, and the city is to pay $400 a day for their use. Mr. Burr said that efforts would be made to have the city build its own plants and operate them. He said that he believed that the municipal authorities were in favor of doing this.

Congress Provides for Capital's Garbage Disposal.

Washington, D. C.—President Wilson recently signed an act passed by Congress giving the district commissioners power to dispose of the city's garbage by reduction or feeding to pigs, poultry or live stock. The commissioners are empowered to take over, by lease or purchase, the plant and equipment operated by the Washington Fertilizer Company for collecting, removing and reducing the garbage and the equipment of M. R. Ready, the contractor collecting and disposing of the refuse. If no agreement can be reached as to prices, the commission is given power to acquire the plants immediately. The price is to be decided upon later by a committee of appraisers appointed by the Attorney-General, the right of appeal to the district court and up to the United States Supreme Court being provided. The commissioners are permitted to feed the garbage to "pigs, livestock or poultry" on district institution land or on land bought or leased for the purpose; or the garbage may be temporarily disposed of by burial. The purchase of collection equipment, either horsedrawn or motor, is also authorized. A total of $620,000 may be spent to carry out the provisions of the act, under the following limitations: Purchase of garbage plant, not more than $85,000; refuse plant, $50,000; pigs, livestock and poultry, $200,000.

MISCELLANEOUS

Preparing New Zoning Plan.

Springfield, Ill.—Following the failure at the last moment of legislation providing for "zoning," Senator Edward J. Glackin is preparing a new bill, to be introduced in the Illinois legislature of 1919, for the "zoning" of Illinois cities. He has conferred with the City Planning Committee of the City Club of Chicago. The new proposal differs radically in two particulars from zoning legislation heretofore proposed or adopted in American cities. The New York plan now in operation and the plan embodied in the Chicago bill defeated at the last session of the Illinois legislature, are based on the police power of the community to protect, promote the health, comfort, safety, and welfare of the people. The community in securing such conditions is under no obligation to pay compensation to any vested interest which might be adversely affected. The theory underlying Senator Glackin's proposal is that the creation of such a building zone or district would be a local public improvement, similar, for instance, to a street-paving or street widening operation. Property prevented by the districting regulations from attaining its most profitable use would be compensated by damages, while property benefited by the restrictions would be assessed. The city would perhaps contribute from general taxes in cases where the improvement is of more than local importance. Senator Glackin provides in his plan for hearings of all parties interested before the board of local improvements, for the veto of a districting plan or of a change from a plan already adopted by a petition of 40 per cent of the property frontage, for the approval of districting ordinances by the city council and for opportunity for property owners to file objections to the assessment roll in the courts. There is another fundamental difference between Senator Glackin's plan and that, for instance, which New York has adopted. The New York districting regulations are conceived fundamentally as a city planning enterprise. The major part of the city is districted according to a zoning plan, the relations of one district to another being carefully worked out in advance. The Glackin plan leaves the initiative largely in the hands of local property owners and an adverse petition by 40 per cent of the frontage owners in any community would effectually prevent the formation of a "district." Senator Glackin's plan is a departure from accepted theories of "zoning," and a number of questions have been brought up by Chicago City Club members. What would be the practical effect of its adoption? The property owners would be more amply protected. Would he be too well protected? Would a minority of local property interests, armed with a veto power upon any proposal for the formation of a district, be able to check regulations needed for the benefit of adjoining districts or of the city as a whole? Would this veto stand in the way of a comprehensive zoning plan for the city and bring about only a "spotty" regulation? Would the penalty of having to pay an assessment to keep his neighbor from erecting an objectionable structure deter many property owners—particularly those of small means—from agreeing to a desirable districting plan? The Glackin plan, as at present worked out, provides no procedure by which the boundary lines of a proposed district would be determined. And yet the character of the regulations—in fact, the question of whether or not a protesting minority might block the plan entirely—would depend upon the boundary lines arbitrarily drawn by the Board of Local Improvements or by local petitioners. Senator Glackin asserts that in his opinion the plan proposed at the last session can not be passed, that the more conservative proposal which he outlined would stand a better chance of adoption.

Army Engineering and Construction Expenditures.

Washington, D. C.—The Appropriations Committee of Congress has been in conference with experts of the War Department to consider the estimates for the coming fiscal year. The total estimates call for $11,771,666,847. Some of the principal items in the estimates for engineering construction and equipment are as follows: Water and sewers at military posts, $70,569,605; barracks and quarters, $187,190,800; roads, walks, wharves and drainage, $35,117,175; construction and repair of hospitals, $83,653,612; engineer equipment of troops, $135,000,000; engineer operations in the field, $892,000,000; armored motor cars, $347,972,500.

Shipping Board Starts on Housing Projects.

Washington, D. C.—The United States Shipping Board has announced that seven large projects for housing shipyard labor have been decided upon. These will be at Hog Island, Newport News, Camden, N. J., Chester, Pa., Bristol, Pa., Sparrows Point, Baltimore, and Wilmington, N. C., and altogether they will cost about $10,000,000. Perhaps the most extensive will be near Camden, N. J., where contracts have already been let for 907 houses, mostly of brick, at an average of $2,070 each. Between $2,000,000 and $2,500,000 will be expended on this project, which is located in Haddon township. The city of Camden, with which the new town will be incorporated, has undertaken to construct schools, fire stations, sewerage and water works; estimated cost, $325,000. About the same amount will be spent by the shipping board in playgrounds, parks and other modern city improvements. The government will also undertake the construction of street-car line extensions at a cost of $125,000. Shipworkers will be given an opportunity to buy their homes with the condition that two years after peace is declared there may be a reappraisement, and if the value of the property has decreased, the final payment may be made at the latter value.

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Police Pensions—Removal.

(Iowa) Under Code Supp. 1913, §932j et seq., order of trustees of pension fund of city of Des Moines removing member from police pension roll because awarded compensation for injuries under Workmen's Compensation Act held improper.—Dickey v. Jackson, 165 N. W. 387.

If city resisted injured police officer's claim for compensation under Workmen's Compensation Act on ground he had been placed on roll of police pension fund its remedy was to raise question in proceeding for compensation, and not to remove member from pension roll.—Id.

Poor Pavement—Time Limit in Action.

(Iowa) Code, § 989, providing no action shall be brought questioning street improvement or sewer certificates or bonds after three months from order of issuance, is applicable to suit by property owner to enjoin collection of special assessment for paving on ground work was poorly done and has become fraud on owner.—Plagman v. City of Davenport, 165 N. W. 393.

Picketing—Municipal Ordinance—Conspiracy.

(Or.) Municipal ordinance declaring that to loiter or parade back and forth, or cause any person or persons to so parade in front of or in vicinity of any store, factory, etc., shall be prima facie evidence of conspiracy to injure business patrolled, is invalid; such facts having no tendency to establish such conspiracy.—Hall v. Johnson, 169 P. 515.

(1) (Or.) Municipal ordinance directed against conspiracies to injure trade, business, or commerce, and providing penalty for violation thereof, has no extramural effect, is not invalid on ground that it is not local municipal legislation.—Hall v. Johnson, 169 P. 515.

Building Regulation—Police Power.

(W. Va.) A limitation upon an owner's use of city property cannot be imposed by law for the benefit of other property owners.—State v. Stahlman, 94 S. E. 497.

(W. Va.) Under charter provision authorizing city "to regulate the height, construction, and inspection" of new buildings, it could not prevent owner of lot in built-up section, between three and four-story buildings, from erecting a one-story building, by refusal of a permit to erect it.—State v. Stahlman, 94 S. E. 497.

Charter, authorizing city "to regulate the height, construction, and inspection" of buildings, confers authority respecting the height of buildings only to limit or restrict it for the safety of persons and property.—Id.

(W. Va.) Prevention of erection of buildings in city, lower than adjacent buildings, has no such tendency to prevent danger from fire as would justify or validate such act under state's police power.—State v. Stahlman, 94 S. E. 497.

Street Grade—Ordinance—Established Datum.

(Ill.) Ordinance being basis of all improvements under Local Improvement Act must for purpose of showing respective cost of improvement indicate grade of street to be improved, either on its face or by reference to other ordinances, etc.—City of Staunton v. Bond, 118 N. E. 47.

Establishment of grade of sidewalk is legislative function to be exercised by council, and it cannot be delegated to committee or city official; hence, if ordinance requiring sidewalks does not establish grade, it is fatally defective.—Id.

Grade for sidewalks is sufficiently established for local improvements where improvement ordinance refers to established datum.—Id.

Ordinance held by reference to plats and established datum to sufficiently describe grade of sidewalks.—Id.

Picketing—Police Power.

(Tex. Cr. App.) Ordinance prohibiting walking back and forth or loitering in front of business places, to persuade persons by sign or otherwise from entering to transact business, does not conflict with Rev. St. arts. 5244, 5245, or Pen. Code 1911, art. 1478, allowing formation of labor unions and persuasion of employees.—Ex. parte Stout, 198 S. W. 967.

(Tex. Cr. App.) El Paso charter, § 2, empowering city to protect health, life, and property, and to preserve order and security of city and inhabitants, gave power to prohibit loitering or walking back and forth in front of places of business for purpose of persuading persons from entering.—Ex parte Stout, 198 S. W. 967.

Change of Grade—Damage—Abutting Owner.

(N. Y. Sup.) Though at common law abutting owner is not entitled to recover damages from change of grade in public highway, it is competent for legislature to provide for such compensation.—City of Corning v. O'Neill, 167 N. Y. S. 743.

Though right of access of abutting owner to his premises is covered by Railroad Law, § 92, providing for acquisition of lands and easements by condemnation to eliminate grade crossings, mere change of grade of street or closing it altogether at some point not in front, but beyond the premises, does not entitle him to damages.—Id.

Special Assessments—Benefits.

(Ill.) Under no circumstances, no matter what plan is followed, can property be assessed in special assessment proceeding more than it is specially benefited.—City of Staunton v. Bond, 118 N. E. 47.

Assessment—Railroad Station.

(N. Y. Sup.) Railroad station property, while used for railroad purposes, cannot be assessed for benefits in proceedings for opening and extending a street.—In re Blondell Ave. in City of New York, 167 N. Y. S. 789.

Poor Pavement—Fraud—Assessment.

(Iowa) Merely because concrete pavement is of poor quality, and in seven years has become badly cracked and disintegrated, though cause is doubtful, does not give property owner cause of action to enjoin collection of special assessment for cost of paving on ground of fraud.—Plagman v. City of Davenport, 165 N. W. 393.

Assessment—Illegality.

(U. S. Sup.) Where a special assessment to pay for a particular improvement has been held to be illegal the United States Constitution does not prevent the making of a new and just assessment to pay for the completed work.—Schneider Granite Co. v. Gast Realty & Investment Co., 38 S. Ct. 125.

Motor Vehicle Regulation—Police Power.

(Mo.) Regulation of use on city streets of vehicles such as automobiles which are capable of very rapid movement is within police power reserved to city.—City of St. Louis v. Hammond, 199 S. W. 411.

Public Building—Damage to Property.

(N. Y. Sup.) Where a city appropriated 6¾ feet of a street to build an expensive ornamental front on a public building and shut out light and air of an adjoining landowner without compensation, injunction will not be granted because adequate relief can be afforded by compensatory damages.—Hellinger v. City of New York, 168 N. Y. S. 271.

Motor Vehicle Regulation—Evidence of Speed.

(Ala.) A municipal ordinance regulating traffic on streets is not void for unreasonableness or uncertainty because it fails to provide the rule of evidence that a rate of speed in excess of 30 miles an hour for a distance of a quarter of a mile shall be presumptive evidence of excessive speed as is provided by Acts 1911, p. 642, § 21.—Hood & Wheeler Furniture Co. v. Royal, 76 So. 965.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

May 2[illegible]-June 1.—CANADIAN PUBLIC HEALTH ASSOCIATION. Meeting with Ontario Health Officers' Association, Hamilton, Ont. Secretary, J. G. Fitzgerald, Toronto, Ont.

June 4, 5.—PENNSYLVANIA STATE ASSOCIATION OF BOROUGHS. Seventh annual convention, Chamber of Commerce, Pittsburgh, Pa. Secretary, J. Herman Knisely, chief, Bureau of Municipalities, Department of Labor and Industry, Harrisburg, Pa.

June 4-6.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Chicago, Ill. Secretary, Chief James McFall, P. O. Box 1015, Washington, D. C.

June 4-7.—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Worcester, Mass.

June 5-7.—NATIONAL MUNICIPAL LEAGUE. Annual meeting, New York, N. Y. Secretary, Clinton Rogers Woodruff, North American Bldg., Philadelphia, Pa.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 11-13.—MAYORS AND OTHER CITY OFFICIALS OF NEW YORK STATE. Annual conference, Newburgh, N. Y. Secretary, William P. Capes, 25 Washington St., Albany, N. Y.

June 19-21.—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual meeting, Atlantic City, N. J.

June 19, 20.—LEAGUE OF TEXAS MUNICIPALITIES. Sixth annual convention, in cooperation with the Texas Commercial Executives' Association, San Antonio, Tex. Secretary, Edward T. Paxton, University of Texas, Austin, Tex.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual meeting, Northwestern University, Evanston, Ill.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Society of Mechanical Engineers.

The spring meeting of the American Society of Mechanical Engineers will be held this year at Worcester, Mass., June 4 to 7, with headquarters at the Hotel Bancroft. Professional sessions will be held both at the hotel and at the Worcester Polytechnic Institute, and will largely relate to questions with which engineers are now having to deal in connection with the war. The following is an outline of the program:

Tuesday Eve'g, June 4.—Welcome by the mayor and the president of the Chamber of Commerce, with an address on "The Growth of an Industrial City" by Charles G. Washburn (Hotel Bancroft). Reception and musical program at the Worcester Art Museum, followed by dancing.

Wednesday, June 5.—Professional sessions morning and afternoon (Worcester Polytechnic Institute). Papers contributed by the local sections of New England and of the Providence Engineering Society; miscellaneous papers on technical subjects; a paper on "Safety Education in Technical Schools and Universities."

General war session, evening (Hotel Bancroft). Addresses on the "Procurement Program of the Government," after which the party will adjourn to the roof garden.

Thursday, June 6.—Special sessions, morning (Worcester Polytechnic Institute). "Fuel Economy," "Vocational Training" and general engineering subjects.

Luncheon will be served at the Norton Company's plant, where a brief session will be held in the afternoon, after which there will be an inspection of the interesting community housing and garden projects of this company.

Dinner at the Worcester Country Club, with a lecture on "Harvard's Contribution to Astronomy" by Dr. S. I. Bailey, followed by dancing.

Friday, June 7.—This day is reserved for an automobile trip to Camp Devens via Clinton Dam; lunch at Camp Devens; continuation of the trip to Concord and Lexington, returning via the Wayside Inn.

The following papers will be among those presented: "The Public Interest as the Bedrock of Professional Practice," Morris L. Cooke; "Moisture Reabsorption of Air-Dried Douglas Fir and Hard Pine, and the Effect on the Compressive Strengths," Irving H. Cowdrey; "A High-Speed Air and Gas Washer," Lieutenant J. L. Alden; "Efficiency of Gear Drives," C. M. Allen and F. W. Roys; "Some Economic Aspects of Fire Protection," J. Donald Pryor and Frank V. Sackett; "Self-Adjusting Spring-Thrust Bearing," H. G. Reist; "Stresses in Machine When Starting or Stopping," F. Hymans; "An Investigation of the Fuel Problem in the Middle West," A. A. Potter; "Oil Fuel in New England Power Plants," H. W. Ballou; "Problems and Hazards in War Times."

National Fire Protection Association.

The fire prevention and protection aspects of the war work of the nation were the most important subjects taken up at the principal session of the twenty-second annual convention of the National Fire Protection Association, held in Chicago May 9-11.

Past president Merrill, who is now chairman of the Fire Prevention Section of the War Industries Board of the National Council of Defense, described the work of his committee; W. E. Mallalieu, general manager of the National Board of Fire Underwriters, sent a paper recording the accomplishments of the national board for the national government since war was declared, and Professor Woolson's committee reported upon emergency housing legislation. These were the chief war subjects on the program.

In spite of the war service of many members attendance was good. For the first time in its history the N. F. P. A. has more than three thousand members. This increase in membership was made in the latter part of the last association year after there had been a considerable decrease following enlistment of members in the national services.

At a luncheon arranged by the Chicago chapter of the N. F. P. A. on Friday the principal address was delivered by the dean of the Armour Institute of Technology. The delegates visited the underwriters' laboratories Wednesday afternoon. Engineers of the laboratories explained operations for tests of various devices and materials, and for the special benefit of the visitors a column test was conducted in the new testing department of the laboratories.

Former president Merrill, in his speech, said that there are ten airplane factories and one hundred munition plants in the United States that have an extremely serious fire hazard. The committee considers any place where materials for the government are being handled, stored or manufactured as a munition plant. The Fire Prevention Section will call attention of government departments giving out contracts to lack of fire protection in munition plants where the hazard is serious, and the plan will be to insert clauses in renewal contracts calling for what fire protection the federal government may consider necessary. The Fire Prevention Section has fire safety jurisdiction over all material used for war purposes, wherever manufactured, handled or stored. The section is now asking for volunteers from the fire protection engineers of the country, who will be asked to make careful examinations into the fire protection of all munition plants in the country. It is planned that these engineers shall go to Washington for two weeks, where they will be carefully instructed as to their duty and as to the exact information desired by the Fire Prevention Section. The chief purpose of the inspections will be to bring before the section such definite and clear information as to hazards and as to methods of correcting these hazards that the committee may give specific instruction and orders from Washington.

Efficiency of the work done to promote fire safety by the National Board of Fire Underwriters was shown in the paper prepared by W. E. Mallalieu, its general manager, and presented by Ira H. Woolson, consulting engineer. During the construction period an engineer of the national board was present at every army cantonment, examining into the water supply, fire

(*Continued on page* 462)

INDUSTRIAL NEWS

Steel Products and Cast Iron Pipe.—Judge E. H. Gary, chairman of the committee on steel and steel products of the American Iron and Steel Institute, has announced a number of changes in the maximum prices on iron and steel products, as published in the institute booklet last January. The committee has received from a sub-committee reports based on information received from representative manufacturers of various lines of steel and steel products, and from such reports and other data available the committee has concluded that certain changes and modifications in the maximum prices, differentials, extras, etc., as heretofore recommended by the institute and published in its pamphlet dated January, 1918, are fair and reasonable, and the committee recommends that revised maximum prices, differentials and extras be adopted, to take effect immediately. In some cases, as in that of scrap, on which numerous changes were announced in a supplement to the booklet, minor changes in the way of safeguards are announced. In the case of pig iron a statement intended to make clear the meaning of the institute as to base price is inserted and the 10 per cent. per gross ton above price of basic added to Bessemer is made to apply to Bessemer iron up to 3 per cent. silicon. In low phosphorus pig iron, copper bearing iron, with copper not exceeding 0.25, the price is $19 per gross ton above base instead of $17 as heretofore. On cast iron water pipe the Birmingham price is raised from $49 in the booklet to $55; the New York price from $55.35 to $61.35, and the Chicago price from $54.35 to $60.35.

These prices are for 6-inch, Class B and heavier. On 4-inch the prices would be $3 more per ton and on Class A $1 extra on all prices.

The iron and steel industry is concerned with the problem of maintaining present operations more than with the problem of increasing them. Efforts will be made to curtail the decline in output that usually occurs in the hot weather. Pig iron and steel supplies are almost entirely shut off from industries that are not directly helpful toward winning the war, and jobbers are in substantially the same position. The present condition, however, is regarded as largely temporary. As a result of the recent meeting in New York, when the Director of Steel Supplies, J. Leonard Replogle, called for a maximum diversion of steel to the filling of war orders, a 100 per cent. war service had been pledged; but it is not definitely known that this 100 per cent. is really required, even for a short period. That question is being worked out by the joint committee representing the government and the steel manufacturers, just appointed. It will determine, and probably in a very short time, what the steel supplies are going to be and what the requirements of the war activities, month by month, are. On this committee are J. A. Farrell, president of the United States Steel Corporation; E. G. Grace, president of the Bethlehem Steel Corporation; H. G. Dalton of the Pickands-Mather Company; J. A. Topping, chairman of the board of the Republic Iron and Steel Company, and E. A. S. Clarke, president of the Lackawanna Steel Company, all representing the steel interests, and these members of the War Industries Board: Alexander Legge, J. L. Replogle and General Hugh L. Johnson.

There has been a determined agitation to have the government commandeer the steel plants and take complete supervision of the output, but some officials have argued that this course would not bring about more favorable results than the present system of private operation. As the matter stands there is little likelihood that drastic steps will be taken until the joint committee has reported and the whole matter has been placed before the "Super-War Council."

Exhibitors at St. Louis Water Works Convention.

The Water Works Manufacturers' Association was very fully represented in the exhibit room, but three or four failing to occupy the spaces assigned to them. On account of war conditions the exhibits were restricted in weight to 50 lbs. each, and on tables in the small booths provided were displayed the literature of the companies, models and small samples. The expressions of satisfaction with this sort of exhibit were numerous among exhibitors and visitors, perhaps enough to warrant a continuance of the policy. While the exhibit hall was at the other end of the building from the convention hall, it was on the same floor and the attendance was good.

The exhibitors included the following:

American Bitumastic Enamels Co., 17 Battery Place, New York. Hermastic coatings a protection for water pipe, tanks, stand-pipes, concrete structures and other parts of hydraulic plants.

Allis-Chalmers Mfg. Co., West Allis and Milwaukee, Wis. Its only exhibits were the four 30,000,000-gal. vertical compound pumping engines at the Chain of Rocks pumping station of the St. Louis water works; the six triple-expansion high-duty engines at the Baden station with a total capacity of 80 million gallons a day; and the three vertical triple-expansion high-duty, 20,000,000-gal. pumping engines at Bissell's Point.

Badger Meter Mfg. Co., Milwaukee, Wis. A sample water meter and blueprint circulars showing section of the meter and connections. The theory on which the meter has been constructed is that every part shall be as strong as the other; that is, every point but one; the bottom is a plate of soft gray cast iron, thoroughly galvanized, and rust proof, with breaking strength of only 600 lbs., so that if the meter freezes the bottom plate will break before anything else is unduly strained. This bottom is replaced at a cost of a few cents and the meter is as good as new.

Birch-Hentz Mfg. Co., 1100 S. Kilbourn avenue, Chicago, Ill. Pump valves.

Buffalo Meter Co., 2917 Main St., Buffalo, N. Y. American and Niagara water meters in sizes from ⅝ x ½ in. to 3 in. The measuring chamber is of large capacity and the measuring disc is of hard rubber with metallic plate reinforcement. When a Niagara meter is frozen, usually the upper half of the outer case breaks, relieving the inner parts from strain. This half for the ⅝-in. case costs but 60 cents for replacing the broken part. When an American meter freezes the dome of the bronze top springs upward, relieving pressure on other parts. It may be easily pressed back and the top used over again. The only difference between the three meters made by the company is in the cases. Curb boxes, sealable vertical pipe meter connections, jet meter for filling sewer flush tanks, pocket meter-reading books, meter record-books, and loose-leaf ledgers for meter accounts are made by the company.

Builders' Iron Foundry, Providence, R. I. Venturi meters.

Central Foundry Co., New York. Universal cast-iron pipe.

Chicago Bridge and Iron Works, Chicago, Ill. Steel tanks and towers.

H. W. Clark & Co., Mattoon, Ill. Clark meter box, Clark coupling yoke for meter setting on riser pipes and slotted openings for service pipe, water-meter tester, leak indicator, service and valve-box finder, wireless pipe-locator, sonophone, service and valve boxes, valve housings, collapsible forms for casting concrete box-bodies, and a full line of municipal castings.

E. I. du Pont de Nemours & Co., 35th and Gray's Ferry Road, Philadelphia, Pa., Harrison Works. Chemicals.

East Jersey Pipe Corporation, Fulton and Church Sts., New York City. Works at Paterson, N. J. Lock bar steel pipe.

Electro Bleaching Gas Co., 18 E. 41st St., New York City. Plant at Niagara Falls, N. Y. Manufacturers of liquid chloride and of apparatus for applying it to the sterilization of water supplies. Wallace & Tiernan Co., contractors, New York, instal outfits.

Ford Meter Box Co., Wabash, Ind. Meter box and setting.

Glauber Brass Manufacturing Co., Cleveland, O., had a full line of samples of couplings, cocks, valves, goosenecks, branch connections and information about their tapping machine.

Hays Mfg. Co., Pa. Curb, service and stop boxes; drilling machine.

Hersey Manufacturing Co., E and 2d Sts., South Boston, Mass., showed two sectional models of meters. The three models of disc meters have the Hersey anti-frost bottoms in the form of a copper-lined cast iron bottom with a groove cut to a fixed depth which always breaks under frost pressure and relieves all of the working parts from damage.

Modern Iron Works, Quincy, Ill., showed a model of their water-meter housing, meter yoke and connection, valve stems for shut-off cocks, detectaleak (audiphone), etc. The company also supplies the Taylor portable steel derrick for lifting and handling pipe and construction materials, flow regulators for flush-tanks and like constant flows of water, valve boxes, gate valves, hydrants, indicator posts, repair [illegible] manhole covers, tool carts, street cleaners carts and scrapers gages, revolution counters, liquid-level recorders, pipe locator, dip needle, service boxes, shut-off rods and keys, corporation cocks, lead-flange couplings and tools, goose-necks, gate valves, tapping machines, diaphragm pumps, pipe clamp and plugs, lead melting furnace, pipe wrench, pipe vise, stand and bender, tool kit, pipe cutters and drills, pipe pusher, pressure regulators, electro hydraulic valve, in short, anything which the water works engineer needs for his daily construction and maintenance work.

H. Mueller Mfg. Co., Decatur, Ill. Lead flanging machine and plumbers' goods.

National Water Main Cleaning Co., New York. Apparatus for cleaning water mains.

New York-Continental-Jewell Filtration Co., Nutley, N. J.

Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., materials for treatment of water, including hypochlorite of lime or chlorinated lime, natrona crushed block sulphate of alumina, crushed excelsior sulphate of alumina, lump ammonia alum, and a Keystone made of pure white sulphate of alumina.

The Pitometer Company, 25 Elm St., New York. The Cole recording pitometer was the principal exhibit.

Pittsburgh Filter Mfg. Co., Pittsburgh, Pa. Books of photographs of plants in which this company's filters have been constructed.

The Pittsburgh Meter Co., E. Pittsburgh, Pa., showed sectional models of Keystone and Eureka water meters. The case of the former is slightly distorted should the meter freeze, which distortion is easily corrected and the meter put back into service again, though it is sufficient to prevent injury to the operating parts by the freezing.

R. U. V. Co., 120 Broadway, New York. Ultra-violet ray system of water sterilization and apparatus for the same.

A. P. Smith Mfg. Co., East Orange, N. J., showed a model of the Smith hydrant for high and low pressures and Kellogg patent plug, and photographs of machines in operation.

Sullivan Machine Co., 122 S. Michigan Ave., Chicago, Ill., distributed pamphlets descriptive of the Sullivan air-lift pumping system with the component air compressors, boosters, foot pieces, well tops, which they manufacture.

Thomson Meter Co., Brooklyn, N. Y., showed the Lambert disc, current and duplex meters.

United States Cast Iron Pipe and Foundry Co., New York.

Wallace and Tiernan Co., New York. Contractors for water sterilization plants.

The members of the Meter Manufacturers' Exchange distributed at their exhibits the advertising literature of the Exchange, which is a common publicity agent, "Are You Selling Water," "Saves Coal, Oil, Labor, Machinery," "Business Policy" and monthly booklets, "What Leaks Are Costing You Every Day" for April, and "How Long Are You Going to Keep It Up," for May.

The Association of **Waterworks** Manufacturers elected J. C. Clifford, of the Pittsburgh Meter Co., president; E. D. Kingsley, of the Electro-Bleaching Gas Co., vice-president; C. R. Wood, of R. D. Wood & Co., treasurer, and John A. Kienle, Electro-Bleaching Gas Co., secretary.

NEWS OF THE SOCIETIES

(*Continued from page 460.*)

department services, alarm system, heating and lighting arrangements, possibilities of local assistance in fire fighting and exposure hazards. In all these cases national board engineers were carrying out plans which had been carefully prepared in the offices of the army quartermaster general before construction of army cantonments was begun. It is a remarkable record, that of construction valued at $100,000,000 the loss from the time construction began until cantonments were turned over to the government was but $2,150. Inspection services of national board representatives have not been confined to cantonments. These men have also inspected as many as one hundred and sixty shipyards and many other plants owned or used by the national government.

The association, in declaring "warfare against the needless sacrifice of human lives and property by fire," advocates the following measures:

1. The adoption by municipalities of the Standard Building Code of the National Board of Fire Underwriters to the end that fire-resistive building construction may be encouraged, the use of inflammable roof coverings prohibited, adequate exit facilities from buildings assured, and interior so designed and fire-stopped as to make easy the extinguishment of fires therein.
2. The adoption by all states of minimum building requirements for the protection of state and county hospitals, schools, asylums and similar institutions outside city limits and of small communities in which the establishment and enforcement of a building code is impracticable.
3. The enactment by each state of the fire marshal law advocated by the Fire Marshals' Association of North America to the end that official investigation may be made of the causes of all fires, preventable fires may be eliminated by public education, and the crime of arson stamped out.
4. The adoption of the association's suggested ordinance providing for the systematic inspection of all buildings by city fire marshals or local firemen to insure the vigorous enforcement of rules for cleanliness, good housekeeping, and the maintenance of safe and unobstructed exits, fire-fighting apparatus, and other protective devices.
5. The enactment of ordinances similar to that of Cleveland, Ohio, fixing the cost of extinguishing preventable fires upon citizens disregarding fire prevention orders, and a more general legal recognition of the common law principle of personal liability for damage resulting from fires due to carelessness or neglect.
6. The wider general use of the automatic sprinkler as a fire extinguishing agent and life saver, and the more general adoption of the fire division wall as an important life saving exit facility.
7. A careful study of the technical surveys of cities made by the engineers of the Committee on Fire Prevention of the National Board of Fire Underwriters covering the items of water supplies, their adequacy and reliability, fire department efficiency, fire alarm systems and conflagration hazards, and of the possibility of co-operation among neighboring cities through mutual aid, and the standardization of hose couplings.
8. The adoption of the association's suggested laws and ordinances for state and municipal regulation of the transportation, storage and use of inflammable liquids and explosives.
9. The universal adoption and use of the safety match and legislation prohibiting smoking in all parts of factories, industrial and mercantile buildings except in such fire-proof rooms as may be especially approved for the purpose by fire departments.
10. The education of children and the public generally in careful habits regarding the use of fire.
11. The co-ordination of all these activities through a central administrative officer or body of the state or city having primary jurisdiction, for the purpose of promoting uniformity of action and efficient co-operation.

The association elected the following new officers: President, F. J. T. Stewart, New York; first vice-president, H. O. Lacount, Boston; second vice-president, W. E. Mallalieu, New York; secretary-treasurer, Franklin H. Wentworth, Boston; executive committee, Gorham Dana, Boston; H. W. Forster, Philadelphia; Rudolph P. Miller, New York; H. L. Phillips, Hartford; A. R. Small, Chicago; John B. Laidlaw, Toronto (one year).

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

SEWERS AND WATER WORKS SYSTEMS are to be built by Ogilvie, Minn. The engineer for the work is J. F. Druar.

An ELECTRIC LIGHT PLANT is to be built by Burns, Kans. The improvement was planned by the engineering firm of Archer & Stevens.

Richmond, Mo., is to improve its WATERWORKS. Plans are in process of preparation by the consulting engineer, W. Kiersted.

Salt Lake City, Utah, through its civic planning commission, is to begin the preparation of a CITY PLAN and a program of city improvement. George E. Kessler has been engaged as expert.

Rochester, N. H., is to make PAVING IMPROVEMENTS. The engineer for the work is William A. Grover.

The Modesto and Turlock Irrigation district, Cal., is to build a DAM on its reservoir site. A. J. Wiley has been retained as engineer for the structure.

The borough of Donora, Pa., is to make PAVING IMPROVEMENTS. The engineering firm of Chaney & Armstrong has completed plans for the work.

St. Louis, Mo., is considering the question of allowing the local TELEPHONE company to increase its RATES. The city has retained J. E. Allison as its expert to investigate the finances of the company.

Municipal Journal

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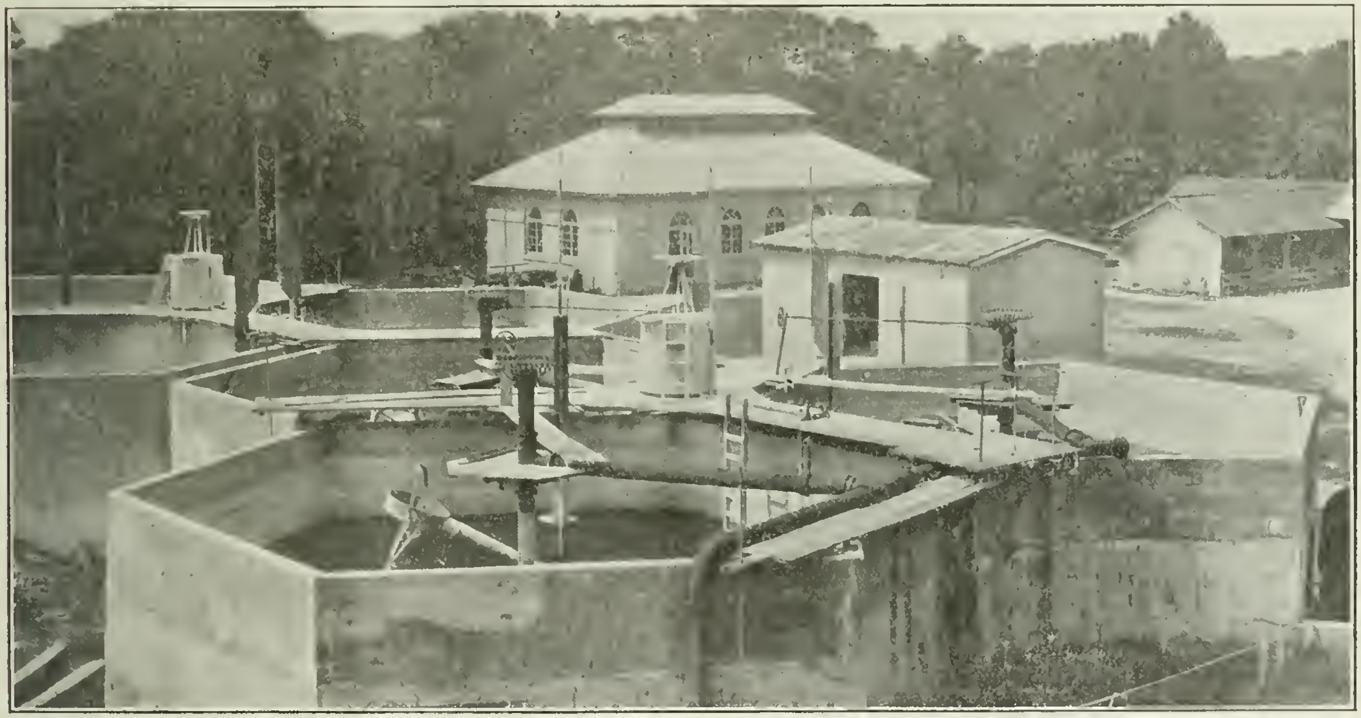
WATER SOFTENING AT DAYTONA, FLORIDA

Treating a Purely Domestic Supply to Effect Economy and Improve Acceptableness—Description of Plant—Theory of Operation—Determining Amount of Lime Needed—After-Precipitation in Mains—Cost

By GEORGE A. MAIN *



GENERAL VIEW OF RESERVOIRS, STOCK HOUSE, AND, IN THE BACKGROUND, THE NEW DISPOSAL PLANT.

The business of the waterworks at Daytona, Florida, is the production and distribution of a domestic supply of water only, the city containing practically no industries. Conservation being the nation-wide watchword at this time, it is peculiarly fitting to reconsider whether the water used in the households of any city is such as to require an enormous daily waste of soap because of its hardness, or to cause injury to linens by the minerals it carries; and if it is, to estimate whether money spent in eliminating the objectional qualities may not be true economy.

Water softening for Daytona was first suggested to the speaker by Dr. Monfort, chemist, of St. Louis, at the annual convention of the American Waterworks Association held at New Orleans in 1910. The writer gratefully acknowledges Daytona's indebtedness to Dr. Monfort, and only hopes that this description of Daytona's experience may result, as did Dr. Monfort's advice, in the adoption by at least one city of a policy of permanently and economically improving the quality of its water supply.

Type of Softening Plant.—Fundamentally, water softening is the process of thoroughly stirring raw water and chemicals together, and allowing the mixture to clarify by the settling of the precipitate. This may be accomplished in separate vessels, in which the water is wholly at rest after agitation is completed, the several basins being alternately and intermittently recharged, which type is called the intermittent type. In contrast to this type is the continuous type of softener, in which the water is always in motion as it passes through the softener, the motion of the water during its self-imposed agitation being quite rapid, but during the completion of the process, the settling, the velocity being greatly reduced by increased cross-sectional area of the conveying channel. There were several small industrial softeners of both types in Florida when we took up the question of type and design, but there were then (in 1910), we believe, no municipal softeners.

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Correspondence with officials at New Orleans, Columbus and Oberlin, Ohio, McKeesport, Pa., and Winnipeg, Canada, and some reading of works on the subject, showed us that the intermittent type was best adapted to our particular character of water, to our flowing artesian supply, and to our intermittent pumpage, all of which bear directly on the type and design.

Design and Operation.—Briefly, the Daytona softening plant, which was doubled in capacity in 1917, is composed of six reinforced concrete settling tanks, hexagonal in shape in order that three may fit together as a unit, thirteen and one-half feet deep, thirty-six feet in diameter, and having a capacity of 90,000 gallons each. The capacity of the plant may be increased indefinitely by the addition of more similar units.

The familiar hydrogen sulphide gas is present in our raw water, as it is in most Florida flowing well waters. To accomplish the removal of this gas by aeration, the gas-laden water is discharged into the tanks through the center of floats, connected by flexible piping with the well water supply, thus always discharging at the *surface* of the water, rather than underneath the body of water as would be the case were the flow direct into the bottom of the tanks. The strength of the well-flow decreases as the tank fills up, the flow entirely ceasing when the water stands at the level of the static head of the well, the depth of the tanks being determined by the well head at Daytona.

Accurately calibrated float gages indicate the quantity of raw water which has entered the tanks, and hence furnish the basis for computing the weights of chemicals. A forty-inch slide rule on the wall of the lime room enables the operator to compute at a glance the amount either of lime or of soda required for any given quantity of raw water, adjustable pointers on the slide indicating directly the correct amounts.

We are now using hydrated lime only, 2.75 pounds per one thousand gallons. Our permanent hardness is very low, only requiring one-sixth of a pound per one thousand gallons of the soda ash. The advantage in softness resulting from this small dose of soda ash is so small that its use was discontinued a year or so ago. The lime is weighed out and made into a strong whitewash in two cypress mixing tanks placed at the junction of the three reservoirs, forming a unit.

Thorough agitation of the raw water after the chemicals have been added is a very essential part of the softening process. The agitation at this plant is obtained by compressed air at 15 pounds pressure delivered through 3/32-inch orifices in pipes laid on the bottoms of the mixing and settling tanks. This air agitation was suggested by a similar method of agitation in use at the E. O. Painter fertilizer works of Daytona. The orifices are spaced about four feet apart each way. Air agitation is begun as soon as the tank is full of raw water.

The lime mixture from the cypress tank is then run into the settling tank and the agitation continued for an hour, after which the air is shut off and the water allowed to settle and clarify. Experiments proved that reaction and precipitation continued in softened water for several days, although most of the precipitation is completed in a few hours; consequently, water for use is always drawn from the tank that has been settling the longest.

The clarified water is discharged through a pipe with a flexible joint so arranged that the suction end of the pipe is above the water during the agitation and settling of the water that is being softened. When it is desired to draw water from any tank, the suction end of the discharge line is allowed to settle into the water and is suspended near the surface by floats so as to continually remove the upper layer of water, which is that most thoroughly settled.

A circular clear-water basin of brick and having a capacity of 46,000 gallons receives the purified water from all of the settling tanks, and from this clear water basin the water is pumped to an elevated steel tank and into the distribution system.

The lime in precipitating carries down with it such other impurities as may be in suspension in the water. About once each month the accumulated sludge in the tanks is drawn off and discharged by centrifugal pumps to the river banks at the southern limits of the city. The quantity of this sludge is approximately twice as great as the amount of lime put into the water.

Analytical Control of the Softening.—The quality of the softened water depends upon the correct determination of the amount of chemicals required per thousand gallons, upon the care exercised in computing and weighing the chemicals, and upon the length of time and thoroughness of the mixing and the length of time the water is allowed to settle. The temperature also affects the result.

In determining the correct amount of lime, an examination is made of the purified water, not of the raw water, as would be done by an analytical chemist. Advantage is taken of the direct relation between temporary hardness and alkalinity, and the dose of lime is proportioned to the alkalinity of the water. Alkalinity plays so important a part in the softening process itself, as well as in the chemical examination of the water, that special knowledge of alkalinity is essential to the informed softening plant operator who has to soften water having a temporary hardness.

There are three distinct kinds of alkalinity—bicarbonate, carbonate, and hydrate—readily distinguished the one from the other by their different characteristics, particularly by the differences in their degrees of solubility and the differences in their effect upon the colors of two organic chemicals used as indicators and so designated. These three kinds of alkalinities are exemplified by three forms of lime found nearly everywhere. Calcium bicarbonate is the alkaline lime found in our well waters. Calcium carbonate is one product of air slaked lime. Calcium hydrate is water slaked lime. Calcium carbonate or air slaked lime differs from the other two forms in that it is practically insoluble in pure water. Calcium hydrate differs from the bicarbonate in that it has an extremely pungent taste, while the bicarbonate in well waters is quite tasteless. Softening of water containing bicarbonate of lime is simply the process of transforming the soluble calcium bicarbonate into insoluble carbonate, when the insoluble carbonate, being in suspension, settles to the bottom of the container, leaving the water free from the lime. This change from the bicarbonate to the carbonate is produced by the addition of hydroxide to an amount equivalent to that of the bicarbonate present. If less hydroxide is added, the water will still be of a bicarbonate alkalinity, and if more is added the water will be of a hydrated alkalinity, the excess of lime that is added remaining in the water and to that extent re-hardening it. The carbonate of lime, although relatively insoluble, is slightly soluble, and to the extent of its solubility it of course remains in the water after the process. The softened water will therefore contain carbonates only, carbonates and bicarbonates, or carbonates and hydrates. It can contain only two kinds, as the bicarbonate and the hydrate cannot both remain in the water at the same time since they react and form the carbonate with a certain amount of whichever of the two forms was in excess.

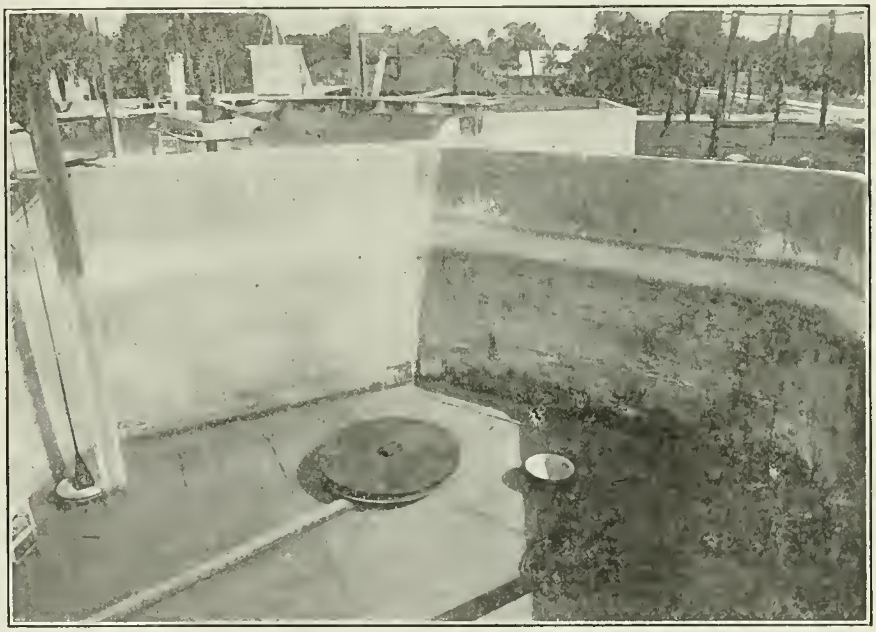
To determine the correctness of the lime adjustment, it is necessary only to ascertain which of the two alkalinities is present and in what proportion. Methyl orange and phenolphthalein are used as chemical indicators. The former possesses the property of being yellow in the presence of any alkaline water, but turns to faint pink after the water is made acid. Phenolphthalein, on the other hand, is colorless in the presence of an acid and also in the presence of bicarbonates, but assumes a red tint in the presence of either of the other two alkalinities; furthermore, the red color of the tested water disappears when sufficient acid is added to neutralize one-half of the alkalinity when carbonates only are present.

If now an acid solution of known strength be added very slowly to a measured quantity of water to which has previously been added a drop of the Methyl orange indicator, and if the amount of acid solution required to change the color from the alkaline yellow to the acid-indicating pink be carefully noted, the total alkalinity of the water may be computed readily. Similarly, the neutralization point between alkalinity and acidity to the phenolphthalein indicator may be ascertained. From these two values, the alkalinity as indicated by Methyl orange (usually abbreviated to "M") and the alkalinity as indicated by phenolphthalein (usually abbreviated to "P"), the kinds of alkalinities present in the water and their respective amounts may be computed readily, by formulas. The values of "M" and "P" are usually expressed in cubic centimeters. If P is zero, bicarbonates only are present in the sample of water and their quantity is indicated by the value of M. If P equals ½M, carbonates only are present and the quantity is indicated by M. If P is less than ½M, 2P measures the carbonates and M minus 2P measures the bicarbonates. If P is greater than ½M, 2M minus P indicates the carbonates and M minus the carbonates equals the hydrates.

The softest water is that showing the lowest total alkalinity. This minimum of alkalinity is not reached, as might be supposed, when the bicarbonates in the raw water are exactly neutralized by the applied hydrates, that is, when the sample gives M just twice as great as P, but rather when a slight excess of hydrates is added which has the effect of reducing the carbonates to a greater extent than the excess of hydrates added. The pungent, flat taste resulting from this hydrate alkalinity, however, is an objection to reducing the water to the absolute minimum hardness in the case of a domestic water supply, and the plan in Daytona is to maintain a slight alkalinity on the bicarbonate side of the neutral rather than on the hydrate side.

The method described for determining the correct amount of lime to be added to remedy temporary hardness is applicable also to the adjustment of the soda ash for permanent hardness. By starting with a known shortage of soda ash and gradually increasing the dose in the softening process until a sample of softened water shows an increase of carbonate alkalinity, the correct proportion of soda ash is ascertained. The acid solution usually used for these tests is a very weak solution of hydrochloric acid of known strength, which is applied to the sample from a graduated tube or burette.

After-Precipitation of Calcium Carbonate in Water Mains. Although practically all the precipitation occurs in the settling tanks within a few hours after the softening precess is performed, a very slight precipitation continues for about a week. Since it would be impracticable to provide settling tanks of sufficient capacity to allow a week's settling, a slight after-precipitation in elevated tanks, mains, service pipes, meters, and house pipes is unvoidable. The quantity of deposit thus left in the distribution system is about the same as that left by the hard water before the installation of the softening plant. The raw water, however, formed a hard scale which was very difficult to remove from the meters, while the precipitated carbonate is very easily removed. After-precipitation, therefore, is not a serious argument against softening. This after-precipitation could no doubt be abated by the application to the purified water of sufficient carbon dioxide gas to return part or all of the carbonate which remains in solution and suspension to the soluble bicarbonate. However, we have not tried this somewhat recent idea and are not yet convinced that the advantage would not be nearly or quite offset by resulting disadvantages and cost.


VIEW OF THE WORKING PARTS OF ONE OF THE UNITS.

CONCLUSIONS.

Water softening is water purification. Not only are undesirable mineral matters removed by this, the Porter-Clark, softening process, but suspended matter and even bacteria, where they exist, are also removed by the entangling and filtering effect of the slowly settling precipitate. Softened water is a healthful water, pleasant to the eye, to the skin, and to the taste.

The cost of the Daytona plant, to date, is about $10,145, approximately 10 per cent. of the cost of the water works. The unit cost of softening, per thousand gallons, is about three cents, which includes lime, operating attendance, repairs, depreciation, and interest on the investment in softening plant.

No increase in water rates was made however, on account of the additional cost of operating the softening plant. On the contrary, the increases in the number of water patrons has so reduced the *per-consumer* overhead cost of operation as to more than offset the per consumer cost of softening. As a going concern, therefore, our profits are greater than before the softener installation, and hence from the point of view of the public's ownership of the waterworks as well as from their point of view as patrons, the softening plant was a wise investment.

Among the benefits accruing from the softening of the water, perhaps the most important of all is personal satisfaction of using a softened water. The direct saving in soaps and washing powders and in wear and tear on clothes is very marked. The elimination of numerous rain-water tanks has not only saved the cost of their frequent cleaning and repairs, but has also materially reduced the number of mosquito-breeding places and thereby tended towards better health conditions. Before the softener was installed, houses were generally equipped with a double plumbing system, one for the hard water to be used for all purposes except bath and laundry, the other for rain water. The cost of this extra piping, tank, etc., was about $100 per residence, the interest and depreciation on which was several times the cost of softening the 50,000 gallons which is about the average annual consumption per customer.

Not every city that has a hard water supply would find it feasible to install a softener. Each city has a distinct problem to be considered independently, and engineers are looked for the discovery, presentation and solution of such problems. All engineers have more or less influence and to that extent are trustees of public interests and accountable to their fellow men.

Whether it be in small things or in great things, in improving the quality of a municipal water supply or in engineering vast armies over the Rhine to Berlin, engineers should ever keep uppermost the democratic thought of public service, than which there is not, nor can there be, any higher calling.

USE OF TAR ON HIGHWAYS *

English and American Practice in the Construction of Tar Pavements—Tar Concrete Pavements—Classification—Patents—Construction.

By ARTHUR H. BLANCHARD, M. Am. Soc., C. E. †

TAR CONCRETE PAVEMENTS.

A tar concrete is one composed of broken stone, broken slag, gravel or shell, with or without sand, Portland cement, fine inert material or combinations thereof, and a tar cement incorporated together by a mixing method.

Classification: Tar concrete pavements may generally be grouped in three classes. The essential characteristics of the three classes are as follows:

Class A. A tar concrete pavement having a mineral aggregate composed of one product of a crushing or screening plant.

Class B. A tar concrete pavement having a mineral aggregate composed of a certain number of parts by weight or volume of one product of a crushing or screening plant and a certain number of parts by weight or volume of sand, broken stone screenings or similar material, with or without a filler.

Class C. A tar concrete pavement having a predetermined mechanically graded aggregate composed of broken stone, broken slag, gravel or shell, with or without sand, Portland cement, fine inert material or combinations thereof.

Patent Litigation: In connection with the design or selection of a suitable type of tar concrete pavement, it is necessary to consider the possibility of an infringement suit being brought by one of the patentees of proprietary pavements. Highway engineers and contractors are primarily interested in the types of tar concrete pavements which may be constructed without danger of litigation rather than in a voluminous discussion of the probabilities of successfully defending infringement suits.

Class A. There is ample evidence at hand that tar concrete pavements of Class A may be constructed without danger of litigation proceedings.

Class B. The history of litigation cases indicates that the construction of unpatented tar concrete pavements of Class B on a large scale will, in all probability, lead to an infringement suit.

Class C. With the exception of the class of tar concrete pavements having mineral aggregates similar to that covered by the Topeka decree, the extensive use of non-patented tar concrete pavements of Class C will usually lead to litigation proceedings.

Foundations: Many failures have occurred due to laying tar concrete pavements on weak foundations. Of the more common types of foundations, satisfactory results have been obtained under medium traffic with thoroughly filled and compacted broken stone and tar concrete foundations. Cement-concrete foundations should generally be used.

Construction: Under Class A, two types of pavements will be considered. The most efficient type, as laid in America, has a mineral aggregate which will comply with the following requirements: All of the broken stone or broken slag shall pass a 1¼-inch screen; not more than 10 per cent nor less than 1 per cent shall be retained on a 1-inch screen; not more than 10 per cent nor less than 3 per cent shall pass a ¼-inch screen.

This aggregate, for small jobs, may be mixed with hot tar cement by hand methods. Usually, however, mechanical heating and mixing plants should be used. In a complete plant for the manufacture of tar concrete, the aggregate is carried by bucket elevators to rotary dryers, where it is dried and the dust exhausted; from the dryer the aggregate is raised by elevators to storage bins; when required the aggregate is drawn from the bins to a weighing device, and from there deposited into a mixer. Such plants are also equipped with tar cement heating tanks and weighing buckets. A plant of this type should have a capacity of from 800 to 1000 square yards to 2-inch wearing surface per day. For the type of tar concrete under consideration, it has been found that the tar mixture should contain between 5 and 8 per cent of tar bitumen.

An important detail of laying is thorough rolling. An even surface and adequate compaction with thorough interlocking of the particles of broken stone may be readily obtained by the proper use of a tandem roller weighing between 10 and 12 tons.

Many methods have been developed for the application of the seal coat of tar. It has been found that seal coats of from one-half to one gallon per square yard of tar cement are distributed most uniformly by the use of hand-drawn gravity distributors followed by a squeegee.

The average cost of this type of tar concrete under normal conditions when laid as a 2-inch wearing course should be from 25 to 40 cents in excess of a water-bound broken stone wearing course of the same thickness.

The second type of tar concrete of Class A to be considered is the two or three-course pavements in which

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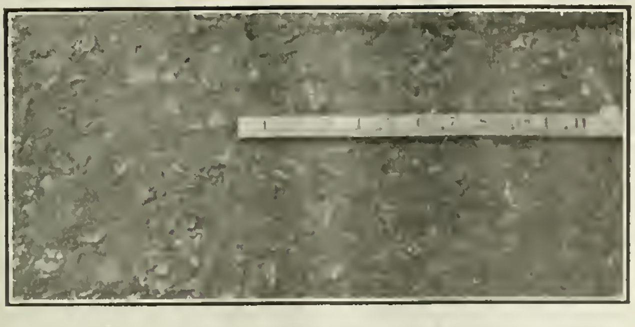
* Continued from Page 446.

† Consulting Highway Engineer, New York.



TAR CONCRETE SURFACE AFTER WEAR FOR FIVE YEARS, NOW NEEDING ANOTHER SEAL COAT.

each course consists of one product of a crushing or screening plant. The excellent tar slag concrete pavements which have been laid in England since 1903 are of this type. Although used by various municipalities, the largest yardage of this type has been constructed by Tarmac, Ltd. One of the Tarmac plants is located at Wolverhampton, adjacent to that of a company producing large quantities of blast-furnace slag. The large molds of slag are transported by small cars from the iron works on a narrow gauge track and dumped near the Tarmac works. These large blocks, while still warm, are broken by sledgehammers to a size suitable for the crusher. After it is crushed and screened into sizes varying from ¼ to 2½ inches it is mixed with a tar compound. Since the slag is warm even after it has been crushed, no heating preliminary to mixing is necessary.

Although in some cases two courses of tar-slag concrete are used, usually more than two layers of tar-coated slag are employed, as was the case with tar-slag concrete pavement laid at Brighton-on-Sea. The details of construction follow: On a well-compacted gravel foundation was spread a scattering of tar-coated slag chips; the bottom layer was composed of 2½ inches of compacted 1¼ to 2½-inch tar-coated slag: the second course consisted of 2 inches of compacted ½ to 1½-inch tar-coated slag; the third course was composed of a thin layer of ⅛ to ⅜-inch tar-coated slag chips, which layer was thoroughly rolled; the pavement was finished by rolling a top dressing of uncoated fine slag screenings.

Tar concrete pavements of Class C, with mineral aggregates similar to the modern Topeka grading, were laid in Pittsburgh, Pa., about 1890. The pavement laid on Lang avenue has been in service, with only nominal repairs, for the past 26 years. Many similar pavements were constructed in several cities of New England as early as 1885. Since 1913 tar Topeka pavements have been laid in several states throughout the Middle West of the United States and also in cities of New England. Some of the best examples of this type of tar concrete pavement has been constructed with about 8 per cent of bitumen in the mix and a light seal coat of refined tar.

TUBERCULOSIS SURVEY IN OKLAHOMA.

To furnish data for combatting tuberculosis and other communicable diseases in Oklahoma, besides improving the general health conditions throughout the state, the Oklahoma Association for the Prevention of Tuberculosis is having a survey made by M. P. Horowitz, of the Department of Biology and Public Health, Massachusetts Institute of Technology, and Dr. Gayfree Ellison, Professor of Bacteriology and Hygiene of the University of Oklahoma, assisted by members of the executive and nursing staff of the association, the State Board of Health and the Board of Agriculture. The survey will include Oklahoma City, Tulsa, Muskogee, Enid, Shawnee, Bartlesville, Ardmore, Chickasha and McAlester. They will continue through the month of September.

WATER WORKS OPERATION—DISTRIBUTION SYSTEM

Keeping Fire Hydrants in Serviceable Condition—Preventing Indiscriminate Use—Inspection of All Parts and Remedying Defects.

INSPECTING FIRE HYDRANTS.

Like valves, fire hydrants are not needed for fire purposes very often, but when one is needed it is of the utmost importance that it should give perfect service instantly. Someone should be held responsible and receive public condemnation if a fire hydrant does not meet requirements when called upon for use.

In order that a given official may be held responsible, however, he must have full authority and power in the control of the hydrants. This means that the City Council should provide ordinances forbidding the use of any fire hydrants except by authority and under regulations issued by the responsible official, and the police and courts should co-operate in enforcing the ordinances. If sprinkling cart drivers, builders and almost anyone is permitted to use the hydrants, no blame can attach to any official should they fail the firemen in an emergency. It is probably practicable to arrange for the occasional use of fire hydrants for purposes other than fire, one essential provision in such arrangement being that immediately after each such use the fire hydrant shall be inspected by a representative of the official responsible for them and such inspection paid for as a part of the fee charged for the use of the hydrant. Except under conditions which provide for an inspection of all hydrants every day or two while being so used, no use of them for other than fire purposes should be permitted. For sprinkling carts probably the best plan is the use of special standing pipes or "cranes" connected with the mains and each provided with a shut-off valve and a hose connection on the end. These not only save the fire hydrants but are also more convenient and save the time of the drivers of the carts.

Some cities have endeavored to prevent the unauthorized use of fire hydrants by providing stem nuts that cannot be turned with a monkey wrench, generally three-sided or five-sided. The result of this is generally that the party desiring to use it employs a pipe wrench, which rapidly wears off the corners of the nut. The only safe rule is to give the citizens to understand that anyone found using a fire hydrant will be arrested and fined unless he can show a permit for such use.

When a fire hydrant is in good order, the stem moves easily and the stuffing box in the top of the hydrant through which it passes does not leak; the gate does not "flutter" when it approaches or leaves the seat and it closes tightly so that absolutely no water leaks into the barrel. Also, the gate opens wide so as to obstruct the water as little as possible and give the maximum obtainable pressure. The drip drains the water from the hydrant barrel rapidly when the hydrant is closed and closes tightly when it is opened. The threads of the outlet nipple are not battered (they should be of standard gage). Each hose outlet or nozzle should be provided with a cap which is attached to the hydrant by a chain and the cap should always be on the nozzle. Also, the threads on both nipple and cap should be kept greased so that the cap can be removed easily; although in putting the cap on it is well to screw it tight against the shoulder so that some pressure is necessary to start it, since this will prevent mischievous boys from removing the cap by hand and dropping stones and sticks into the barrel.

In order to prevent the breaking of fire hydrants by

CLEANING MAINS, LEAKAGE AND METERS (Continued).

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
New Mexico:						
East Las Vegas ...	No	....	None	No	10	Company
Raton	No	....	....	No	12.5	Consumer
New York:						
Amityville	....	....	Sounding rod	No	1	Consumer
Carthage	No	....	None	No	50	Consumer
Dansville	No	Flushing	None	No	None	....
Elmira	No	....	Meters	No	98	City
Glens Falls	No	....	Inspection	No	2	City
Gloversville	No	....	....	No	100	City
Hoosick Falls.....	No	....	Various	No	Small	Consumer
Homer	No	....	Aquaphone	Yes	20	Consumer
Jamestown	No	....	Meters	No	100	City
Kingston	No	....	Pressure	No	....	City
Lancaster	No	....	None	No	100	Consumer
Mechanicsville	....	Not done	Darley leak locator	No	100	Consumer
Mt. Morris	....	....	None	No	2	Consumer
Mt. Vernon........	Yes	By contract	Pitometer survey	No	100	Company
Newburgh	Yes	Not cleaned	Inspection	No	Small[p]	City
Olean	No	....	None	No	100	Consumer
Oneonta	....	....	Inspection	No	3	Consumer
Ossining	Yes	Flushing	Inspection	No	95	Consumer
Oswego	Yes	Flushing	Inspection	No	Small[s]	City
Peekskill	No	....	Surface inspection	No	100	City
Seneca Falls.......	No	....	Watchfulness	Think not	2.5	Company
Sidney	No	Flushing	Patrol	No	None	....
Solvay	No	....	Master meter, watch'g sewers	No	100	Consumer
Spring Valley.....	No	....	Meters	No	100	Company
Tarrytown	....	Never cleaned	Sound and pressure gage	....[g]	100	Consumer
Tonawanda	Yes	Flushing	Inspection	Yes	2	Both
Waterloo	No	....	Inspection	No	25	Company
Waverly	Not much	....	Venturi meter	No	40	Consumer
North Carolina:						
Charlotte	Yes	Not cleaned	Meters	No	100	City
High Point........	....	Never cleaned	Meters	No	85	Consumer
Lenoir	Yes	Not cleaned	None	No	100	City
New Bern	Yes	Not cleaned	Inspection	No	10	City[r]
Raleigh	No	....	None	No	29.5	Both
Rocky Mount	No	....	Inspection	No	100	City
Statesville	Yes	Flushing	Meters	No	90	Consumer

* The word "city" is used to designate municipalities of any nature or water districts; g—consumers own a few; p—only manufacturers and saloons metered; r—consumers own larger than 2-inch; s—for ⅝-inch meter.

METERS. RATES. MUNICIPAL USE (Continued)

City and state	Is deposit on meter required?	Is rental charged for meters? †	Does city obtain water without payment?	Use made of free water	Used for Municipal Purposes	
					Percentage	Is any of it metered?
New Jersey (Continued):						
Helmetta	No	No	Yes	All city uses	......	....
Irvington	No	No	No	....	2	All
Milltown	....	....	....	....	5	Schools
Newton	No	Yes	....	....	20	No
Nutley	....	....	No	....	......	All but sprinkling
Jamesburg	No	No	....	....	......	....
Pleasantville	No	No	Yes	City hall and fire house	......	No
Princeton	No	No	Yes	Flushing streets and sewers	......	All buildings
Rahway	No	No	Yes	All municipal uses	......	No
Wallington	No	No	No	....	......	No
New Mexico:						
East Las Vegas...	No	No	No	....	5	No
Raton	....	....	Yes	Sewers, streets and parks	Small	No
New York:						
Amityville	....	....	No	....	......	No
Carthage	Yes	....	Yes	Schools, churches and fountains	5	No
Dansville	....	....	No	....	10	No
Elmira	Non-owners	....	No	....	3 to 5	All buildings
Glens Falls.......	No	No	Yes	All municipal uses	......	No
Gloversville	....	No	Yes	All municipal uses	20	....
Hoosick Falls.....	No	No	Yes	Flushing	5	No
Homer	....	....	Yes	Schools, churches, fountains	......	No
Jamestown	No	No	Yes	General municipal uses	10	Buildings and flush tanks
Kingston	....	....	Yes	Sewers and sprinkling	......	No
Lancaster	No	No	No	....	15	Schools
Mechanicsville . ..	....	....	No	....	10	No
Mt. Morris.......	....	....	Yes	Sprinkling	......	....
Mt Vernon........	No	No	Yes	Flushing sewers, fire houses, fountains	0.5	Fire houses and fountains
Newburgh	No	No	....	....	......	....
Olean	No	No	Yes	All but street sprinkling and schools	2	All
Oneonta .	....	....	No	....	......	Schools
Ossining ..	....	....	Yes	Sprinkling, fountains, sewers	25	No
Oswego .	Yes	No	Yes	Public buildings and fire	......	No
Peekskill	No	Yes	Yes	Sprinkling, parks, hospitals, all municipal buildings, fire	25	No
Seneca Falls	No	No	No	....	......	No
Sidney .. .	....	....	No	....	......	No
Solvay ...	.....	....	Yes	All municipal uses	15	Yes
Spring Valley	No	No	No	....	......	Schools
Tarrytown ..	....	....	Yes	Sprinkling, fountains, flush tanks	......	No
Tonawanda	No	No	No	....	......	No
Waterloo	No	Minimum charge	Yes	Public buildings	10	No
Waverly .	....	....	Yes	Fountains and public bldgs.	Small	Schools

† Amounts given are annual rentals, in some cases reported as quarterly or monthly.

the wheel hubs of trucks or other vehicles, the hydrant should be at least a foot back from the face of the curb. Where set closer than this, it is desirable to place an iron post just back of the curb on each side of the hydrant to protect it.

In order to be sure that the hydrants are maintained in good condition, they should be tested at least every spring after danger of freezing has passed, and every fall before it arrives, as well as after every known use of the hydrant. These tests should include inspection of each of the points named above, and generally, as a routine operation, a repacking and relubricating of the stuffing box, greasing of the threads of the nozzle and of their caps, so that there may be no delay in using the hydrant. (Waterproof graphite grease is recommended for the nozzles.)

Unless the main valve at the bottom of the barrel is tight, the barrel is liable to fill with water and this in turn to freeze when cold weather arrives, which puts the hydrant entirely out of commission. Unless the drip closes tightly when the main valve is opened, water entering the barrel will escape through the drip into the surrounding ground and keep this so water-soaked that after the use of the hydrant, the barrel will fail to drain and the water in it may freeze. If the drip does not drain freely when the valve is closed, this may be due to a corrosion of the opening, to a packing of it with dirt or to the growth of tree roots into it. In case the stoppage of it is due to corrosion or foreign matter, this may frequently be removed by taking off the top of the hydrant and pushing through the opening a copper wire on the end of a rod. (Care should be exercised not to use a steel wire with a rough end, which would be apt to scratch the seat of the drip and prevent its closing tightly.) Another method of clearing the drip opening is to close tightly all the hydrant nozzles and open the main valve until the pressure has compressed the air in the top of the hydrant, and the barrel is approximately half full of water. Then close the main valve, which operation also opens the drip valve, when the compressed air will tend to force the water out through the drip. If a drip is closed by a root, the obstruction is apt to repeat itself as often as removed and probably the only permanent remedy is to carry a small drain pipe from the drip to a sewer if one is available, or to such point as is beyond the reach of tree roots. "Fluttering" of the gate is apt to cause more or less water-hammer, which may loosen joints and cause leakage even if it does not break any pipes; but perhaps more important is the fact that it is probably due to the gate being loose on the stem or else to a stem which is of too light a weight, either of which may result in a breaking of the hydrant or inability to close the valve tightly. The valves of compression hydrants are provided with leather or rubber faces, and these will not remain in serviceable condition indefinitely, but should be renewed occasionally. Whenever it is found on inspection that the valve cannot be closed tight without exercising considerable pressure, it is probably desirable to put on new leathers. In some cases the increase of resistance to turning the stem may seem to indicate that the valve is wide open when in reality it is merely caused by friction of the thread of the stem in the valve nut. The person making the inspection should know, for each type of hydrant in use, just how many turns are required to open the valve wide, and should see that it is possible to make this number of turns without exerting undue pressure on the stem, and if this is not possible, the stem should be removed and any roughness filed off and the stem thoroughly greased.

The hydrant as a whole should be readily findable under any conditions. This means that some part of it at least should be of a color which can be seen readily at night, while the top should be visible against a white snow-covered ground surface. Probably these requirements are best met by painting the body of the hydrant white or some other light color, and the top of it red or some other dark color. Whatever the colors used, the hydrant should be kept painted for the general appearance of the street as well as to facilitate finding it. In this connection, proper maintenance requires also that snow be removed from in front of and around every fire hydrant, it being made the duty of the abutting property owners, or the street cleaning department, or of some other specially designated person, to see that the snow is removed promptly—in fact, that it is not ever allowed to entirely cover the hydrant even during the heaviest snowfalls.

The preservation of hydrants from freezing and thawing of those frozen will be considered later in connection with similar care of services and mains.

THREE GARBAGE INCINERATORS

Description of Those at Virginia, Chisholm and Hibbing, Minnesota—Replace Rat-Infested Garbage Dumps—Collection of Garbage.

Three incinerators of three different makes, used by the cities of Virginia, Chisholm and Hibbing, Minnesota, have been installed during the past three years, and each is said to have given very good results. They were described by E. J. Hawley a few weeks ago in a paper before the Minnesota Surveyors' and Engineers' Society entitled "Garbage and Refuse Disposal on the Mesaba Iron Range." This paper, slightly condensed, is as follows:

About 1912 rats began to appear in great numbers in this district, and it was concluded that the problem of getting rid of them could be solved to a large extent by abolishing the garbage dumps, dumping being the method employed by all the communities for disposing of their garbage and refuse. The city of Virginia was the first to adopt incineration, and was followed by the villages of Chisholm and Hibbing.

THE VIRGINIA INCINERATOR.

In 1913 the city of Virginia erected a 25-ton capacity Decarie incinerator. The building enclosing the incinerating equipment is of concrete, brick and steel construction, and is approximately 30x35 ft. There are two floors. The upper or hopper floor is reached by concrete approaches at the sides. A radial brick chimney, 4 ft. in diameter at the top and 125 ft. high, carries off the smoke and gases.

The equipment consists of a main incinerator, combustion chamber, preheater and breeching, forced and induced draft fans, feed pumps and injectors.

The incinerator proper consists of a Decarie patent garbage and refuse burner of the all-steel water-jacket type. It is equipped with two sets of grates, one set being a Decarie circulating water-tube grate, made of 2-in. extra-heavy lap-welded pipe, the other being a cast-iron shaking grate of special design for burning refuse.

The ash pits are made in two sections, each of which is provided with two forced draft nozzles to give uniform distribution of air beneath the grates.

The combustion chamber is 14 ft. by 6 ft. 8 in., is constructed of steel casing and lined with 9 in. of fire brick.

The pre-heater is 5 ft. wide by 6 ft. 10 in. long, and is made up of about 400 2½-in. tubes 6 ft. long, expanded into steel plate heads and have a casing of 3/16-in. tank steel plate.

The forced-draft fan is a 70-in. three-quarter housed special American Blower Co. steel fan. It is driven by a direct-connected high-speed engine.

The induced draft fan is a No. 7 American Blower Co. "Sirocco," driven by a high-speed steam engine.

All refuse is dumped directly through the hopper openings into the incinerator. Carcasses pass through these same openings without mutilation. When refuse is dumped, it falls on the circulating water-tube grate, where it comes in direct contact with the fire which is on the lower shaking grate. The material is held entirely away from the walls of the incinerator by the circulating water tubes of this upper grate.

The gases of combustion pass from the incinerator proper into the brick-lined combustion chamber, where they complete their combustion, destroy the odors, and deposit the dust and unburned particles in the dust collector before going into the chimney.

The pre-heater is located between the combustion chamber and the chimney, and the gases pass through its tubes on their way to the chimney.

The air supplying the forced-draft fan is drawn through the pre-heater around the tubes, obtaining its heat from the gases of combustion which are inside the tubes, before being sent through the ducts to the ash pit of the incinerator.

The induced-draft fan draws the gases from the breeching at a point between the pre-heater and the chimney, and discharges same into chimney.

This plant, according to the officials of the city of Virginia, has been very successful. While its first cost is somewhat high, the cost of upkeep is very small.

THE CHISHOLM INCINERATOR.

In 1914 the village of Chisholm constructed a one-unit McGuire-Hunter incinerator. The furnace is housed in a brick building, 24 ft. x 42 ft., with concrete approaches. The furnace is 13 ft. long and 9 ft. wide and is constructed of fire brick with an arched roof about 1½ ft. high above the fire grate at the haunches and 3 ft. at the crown.

The fire is on a level with the bottom of the furnace proper, and burns down instead of up, as is the usual method. The chimney, which is only 28 ft. high, is built at the same end of the furnace as the firebox, but in the opposite corner. The flames pass from the firebox to the back end of the furnace, down and forward again to the chimney; the curved roof deflecting them onto the garbage. During this operation, the odors and gases in the furnace are consumed before they pass to the chimney.

Notwithstanding the apparently low chimney, there is no offensive odor in or about the building. The plant is operated by one man, and is capable of handling six tons of garbage every eighteen hours. A hot water coil and tank is connected with the furnace for heating water for sterilizing purposes.

This type of incinerator, because of its small first cost, is admirably adapted for the small town of limited means.

THE HIBBING INCINERATOR.

In 1916 the village of Hibbing constructed a twin incinerator patented by G. A. Oveson of International Falls, Minn. This plant, like the two described before, is housed in a brick building, 24 ft. x 38 ft. inside. The furnace and fuel room, which is on a floor below the main floor, is of concrete construction and is 11 ft. x 24 ft. inside. The building is reached by two concrete approaches.

The incinerator proper consists of two units, the smoke and gases from which enter into one chimney. Each unit, which is of ten tons capacity, is very simple in its construction. It consists of a large egg-shaped furnace 11 ft. high and 6 ft. at its greatest diameter. The receiving chamber is directly above the firebox, and the chamber being smaller at the bottom than at the top, all refuse falls toward the center directly over the fire. The furnace is built of ordinary brick with a fire brick lining. The firebox is of a triangular shape, with an opening at the top into the receiving chamber. There are no gates of any kind. On top of the receiving chamber there was originally a dome, constructed of sheet steel, into which two doors were inserted. The top of the dome was connected with breeching to the chimney.

The steel dome and breeching proved to be the weak part of the apparatus. After being in use a few months, the dome became warped, and soon burned out, so that it became necessary to make an improvement. The steel dome and breeching were entirely removed, and the receiving chamber was bricked up to the chimney. A fire-brick arch was constructed from the floor up into the chimney. A heavy cast door was built into the brick work. This proved to be a great improvement. In addition to replacing the dome with fire brick, the receiving chamber was relined once during the 1½ years the plant has been in service. At the present time it is a very efficient plant, crude though it appears to be.

On account of the depth from the main floor to the bottom of the units, it is more economical to build this type of plant on a very steep side hill. This will also shorten the approaches to the building.

None of these three plants entirely consume tin cans, but after being put through the incinerator the cans oxidize very rapidly and soon crumble into dust. The most troublesome thing to contend with in an incinerator is bottles. These melt and form great masses in the furnace, which when cooled are very hard to remove.

The collection of garbage on the Mesaba Range is done by day labor. No tax is made against the individual for this work, and it is very efficiently done. Ordinances have been passed requiring all kitchen garbage to be drained, and all unburnable substances to be placed in separate packages. In spite of such ordinances, it is a very frequent occurrence to see portions of cook stoves, bed springs, chunks of concrete and even rocks dumped at the incinerator to be burned.

The cost of burning per ton is dependent to a marked extent on the skill of the attendant. By carefully sorting the refuse and mixing the household garbage with the barrels and boxes from the stores, the fuel cost can be made very low.

The wagon usually employed in the collection of garbage is a steel dump wagon of the Holsbrog type. Ordinary refuse is hauled in a dump wagon.

Since the advent of the incinerator, the garbage dump has disappeared. The old dump site in the village of Hibbing has been cleaned up and platted, and there now are several fine residences overlooking the most beautiful park on the Mesaba Range, from what was formerly the garbage dump.

The incinerators have done much for the health and comfort of the people. They, in conjunction with the small boy, have done much toward exterminating the rats that infest the towns. Two years ago the village of Hibbing averaged $25 per week for bounties on rat tails at 5 cents each. Today the average weekly bounty is less than $5.

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Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

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Municipal Bonds in Demand.

In view of the necessity for greatly increasing the revenue of the Federal Government, it seems very probable, as is reported, that there will be an increase in the amount to be raised by taxes on incomes. This has led those whose incomes from investments are large to cast about for forms of investment that will be free from income taxation, from which has resulted an increased demand for state and municipal bonds, which are exempt from income taxation. The result has been that during May the sale of such bonds was over $28,000,000 or nearly $8,000,000 more than during May of last year, and nearly as much as in May 1916. The average for the preceeding four months of 1918 was about $21,000,000 while the sales for April of this year, while the Third Liberty Loan Drive was on, was only about $14,000,000. With the growing popularity with thousands of individual investors, there is a curtailed supply, and those bonds that are now for sale are enjoying an excellent market.

In spite of the favorable figures given above, which were quoted from the Daily Bond Buyer, that paper calls attention to the fact that the total for the first five months of the year is very much below the average amount of sales for that period, and is in fact the lowest during the past ten years, "emphasizing the restrictive influence of the war on the activities of American states, counties, cities and villages." Indications are therefore that such municipal bonds as may be issued this month for road construction, or other public works whose construction is approved, can be disposed of promptly and at a favorable figure with little if any difficulty.

WHEEL TAXES FOR ROAD FUNDS.

Pleasure vehicles should pay a large part of the cost of constructing and maintaining roadways, and relieve the general taxpayer proportionately.

A proposition to raise the money for constructing and maintaining roadways in both city streets and country highways is being advocated by Charles A. Mullen, director of the Paving Department of Milton Hersey Company, who, without claiming originality for the idea, believes it is essentially a sound one and would be an improvement on the present method of raising road funds. Roads are built and paved for wheels and therefore he thinks it would be logical that they should be paid for by the wheels rather than from the general taxes or by abutting property owners.

One argument he offers in favor of this is that at present we are fooling ourselves very badly as to the cost of highway transportation, a large part of which cost is really that of the roadways used by it, but which are constructed and maintained largely from public funds. Some states, it is true, are using automobile license fees for road maintenance, but this seldom, if ever, is sufficient to provide adequate maintenance, to say nothing of construction and reconstruction. Another argument he offers is that vehicle owners would have it more directly in their power to enforce a proper maintenance of roads, if they furnished the entire cost thereof. He quotes Montreal as an illustration of a city which, because of the necessity of reducing expenditures from the general treasury, has allowed its roadways to get into a condition that costs vehicle owners much more in repairs and in excess of horse power, both of gasoline and of animals, than the saving to the city treasury. Had the maintenance funds been furnished by them, there probably would have been no objection upon the part of the city's officials to maintaining as good roads as the vehicle owners would be willing to provide the money for. If it is argued that the sidewalks should be paid for by the same system, it may be replied, that such is now the case, to a certain degree at least; since all citizens use the sidewalks, all taxpayers should contribute to their maintenance. To the adverse argument that this would be getting away from free public roads, he replies that they are not free now, only everyone is paying for them, but by an unsatisfactory method. "Someone must always pay, so why not have the burden fall equitably upon the road users through a wheel or vehicle tax?"

We have already intimated in these columns our opinion that such a plan is the logical one and should be considered. One argument not referred to by Mr. Mullen is that, with the advent of the automobile, the wheel tax method of raising road funds becomes more logical than ever. A generation ago most of the vehicles used on city streets were employed by merchants and manufacturers in delivering goods for general consumption, and any decrease in cost brought about by improvements in road conditions presumably reduced the cost to the ultimate consumer. While the large consumer benefited to a greater extent than the small one, he also generally paid the largest share of taxes. With the rapid increase in the number of pleasure automobiles, however, we find a large part of the wear and the largest share of the demand for the smoothest pavements resulting from the use of the roadways by these, and consequently a considerable part of the recent increase in expenditures for roadways is for the benefit of that proportion of the taxpayers who own pleasure automobiles. While it is true that the proportion is a considerable and an increasing one, it still constitutes a comparatively small part of the entire list of taxpayers and this part is benefiting by the expenditures of all, without giving to anyone except themselves any return for such use of the roadways.

To such extent as expenditures for construction and maintenance are necessitated by pleasure vehicles, the non-owner, therefore, is paying for something for which he receives nothing in return either directly or indirectly. It seems to us that whatever may be said against the taxing of commercial vehicles, the taxing of pleasure vehicles to an amount that will cover the expenditures made necessary by them is something that the taxpayers at large would be fully justified in demanding. It is not just that any part of the taxes paid by the poor man who does not own an automobile should be used to provide roadways for pleasure riding by the rich.

Fire Hose Becoming Scarce.

Fire commissioner Drennan of New York has asked, and the aldermen have granted, the issuing of $142,770 of special bonds for the purchase of fire hose. Nearly 125,000 feet of the hose on hand is eight years old or more, and that age is considered the limit of safety—in fact, some hose does not last eight years, and manufacturers will not guarantee it for more than three years. Another consideration is that the price of hose will probably rise, if in fact the federal government does not take the entire output.

HIGHWAY MATERIALS ON CAR PREFERENTIAL LIST.

The car service section of the railroad administration has placed stone, sand and gravel for highway purposes next to coal, coke and ore in the preferential list for the use of open-top cars. The following are the regulations issued:

1. Open top cars, suitable for such traffic, should be furnished preferentially for the transportation of coal, coke and ore.

2. Available open top cars, not suitable for the transportation of coal, coke, or ore may be furnished for the transportation of stone, sand and gravel, and when so furnished shall be used preferentially for highway maintenance materials.

3. Open top cars, suitable for the transportation of coal, coke and ore, and available on coal, coke or ore producing roads in excess of the demand of such commodities, may be furnished for the transportation of stone, sand and gravel, and when so furnished shall be used preferentially for highway maintenance materials. The return movement to mines or ovens should be utilized wherever practicable in furnishing car supply for stone, sand and gravel. Every endeavor should be made consistent with keeping up the production of coal, coke and ore, to furnish shippers of stone, sand and gravel with a minimum of forty per cent. of their normal weekly transportation requirements.

4. Roads which are not producers of coal, coke or ore must not use foreign open top equipment for stone, sand or gravel shipments, except for one load in the course of the return movement to mines or ovens.

5. Where the transportation needs of essential road construction or maintenance projects cannot be met by car supply furnished in accordance with the above rules, the State, county or municipal officials in charge of the work, should through their proper State highway department, apply to the Director of the Bureau of Public Roads, United States Department of Agriculture, Washington, D. C., for assistance. Such applications will be considered by representatives of the Department of Agriculture, the War Department, the War Industries Board, the Fuel Administration and the Railroad Administration, and in accordance with the recommendations of such representatives, the Car Service Section will endeavor to furnish car supplies necessary for approved essential road construction or maintenance. It must be understood that car supply for stone, sand and gravel must not be permitted to jeopardize the essential production of coal, coke or ore. If at any time such a result is apparent on individual roads, or generally, orders will immediately issue to curtail the car supply for stone, sand and gravel.

THE A. W. W. A. CONVENTION *

Conclusion of Description of the Thirty-eighth Annual Convention—Experiences with Frozen Services in a Number of Cities—Cost of Thawing.

Reported by CHARLES CARROLL BROWN.

New Rochelle, with 154 miles of pipe and 8,000 consumers, had over 700 frozen meters and 300 services, which were thawed by the electric light company. Many were frozen at the goose-neck and many at the curb, but the principal trouble was at the foundation wall. The depth of frost varied from 8 in. to 4 ft. or even more, the former being in a road covered with snow, although the depth of frost in a terraced lawn alongside was 30 in. Trouble from freezing occurred from December 13 to April. Many service breaks occurred when the frost went out. One main and one hydrant froze.

Chester, Pa., had 2,000 meters freeze in basements on account of lack of coal; also some in curb boxes. Reasons given for the latter were loosely packed sand and gravel around them, risers touching side of meter box, not deep enough to get below the 36-in. of frost.

Terre Haute had 66 service pipes frozen, all but four under paved streets. They were thawed by steam without charge to consumer. The electric light company did not have transformers and could not help. Six hundred meters were frozen. They were taken out and pipe inserted and the water let run to prevent freezing until the cold spell passed, when new meters were set. Of the frozen meters 2.6 per cent were in basements, 11.2 per cent were in 15-in. tile boxes, 4.5 per cent in 18-in. tile boxes, 16 per cent in 3-ft. brick pits, while in brick pits 5 ft. deep there were none. The frost penetrates deeper in the sand and gravel than in the clay of a neighboring city where services 2.5 ft. deep were not frozen.

Syracuse used a gasoline generator thawing outfit, with automobile engine and 15 k.w. d.c. generator at 10 to 50 volts at 1,200 r. p. m., and a switchboard, all put on a sleigh or truck when in use and drawn by a team. Three men were required. Two cables were connected to hydrant and pipes in interior of house, the meter being disconnected. A 20-volt current at the start was increased to 20 to 50 to make the amperage 300. From 2 to 15 min. was required to thaw the small 3A lead services. The total time required averaged 15 min., or 20 services a day if not too far apart. Services are 4 to 4.5 ft. deep. The electric light company also used three outfits. A current of 600 amperes was required for 20 min. to thaw a 6-in. hydrant branch.

In Richmond, Va., many meters and services were frozen, very few meters being damaged. Depth of frost was 30 to 32 in.

In Troy, N. Y., average depth of frost was 5.5 ft. and maximum was 7 ft.

Mason City had 150 services frozen and 2 lead pipes burst, also some frozen mains and 2 hydrants. All were thawed with a steamer. Daily inspections were made of all important hydrants. Colored water through a tap was a sign that freezing was beginning and water was let run until danger had passed.

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* Concluded from page 453.

In Jefferson City, Mo., no service pipes were frozen but nearly 10 per cent of the meters froze.

St. Louis had no mains frozen. Most of the service pipes frozen were where street grades had been lowered. No 2-in. services were frozen. These are put in by the water department, all others by the consumer. Local plumbers thawed the services, digging up and relaying pipe, using a portable steamer with ¼-in. rubber tube to insert in the pipe, requiring three to eight hours and costing $10 to $15.

At Lawrence, Kan., about 100 services were frozen, of which 40 were thawed by electricity, the water department borrowing a 2,300-volt transformer from the electric light company and two resistance boxes. Services were from 25 to 100 feet long and required current for five minutes to an hour or more. The outfit was put on a wagon used as a trailer to an auto truck. Twelve services were thawed in a day.

In St. Louis County, Mo., frost was 39-in. deep and 42 ins. in exposed places. There are about 100 miles of galvanized pipe over which streets have been graded and paved since laying. They all froze this winter. Hot sand was tried but was not satisfactory. A 4,000-volt transformer was obtained and 64 lines of pipe were thawed out readily. About 2,000 services and 1,200 meters were frozen. In a few cases four meters in succession froze on the same connection.

In Minneapolis mains are laid eight feet deep and the frost is often of that depth. The 300 frozen services were thawed by a 40-50 h. p. gasoline engine and 20-k.w. d.-c. generator that were mounted on a frame and put on a truck to haul to place of use.

In Milwaukee, with 84,000 services from mains 6.5 ft. deep, neither mains nor services were frozen. All services must be laid 6 ft. below the established grade and with not less than 6 ft. cover.

The following figures showing cost were given:

The electrical apparatus used in Paterson cost $800 and the average cost of thawing a service was $8.20, half paid by the consumer, including all expenses, overhead charges entire. The Public Service Co. offered a price of $20 for each service thawed which was not accepted. Probably most of the following figures do not include overhead charges.

An Indiana city reported a cost of over $2 a service with current from the electric light plant at about 10 cents per kw.-hr.

In another case a service pipe froze three times in three days, with a charge by the electric light company of $15 for each thawing.

In Madison a block of 6-in. main was thawed by the electric light company for $25. The charge for thawing services was $10 each.

At Kitchener, Ont., the average cost of thawing services with current at 50 cents for each service was a little over $2. There were 360 services frozen and two to three men were required.

At Petersboro, Ont., the cost was $2 to $2.50 per service, five to ten minutes time required. Cost of thawing and repairing meters was 75 cents each.

The charge by the Niagara Falls Electric Company was $10 a service. Plumbers charged much more, a Buffalo plumber claiming he was paid $200 in some cases. Letting the water run cost $4.55 more than not, which was cheaper than thawing by electricity.

In Green Bay, Wis., the electric light company charged $1.50 per hour for current and $3 per hour for crew. The total charge per service ranged from $3.50 to $12.

The electric light company thawed services in New Rochelle for $15 each and had three wagons at work. Others using steam charged much more.

The property owner was charged $7.50 per service by the Trenton, N. J., water department, allowing little or nothing for overhead.

The cost of the electrical apparatus used in Gary, Ind., was $1,500, and the cost for 298 services, three hydrant branches and one main averaged $3 each. The electric light company also used three outfits and charged $10 for each service.

The Canadian General Electric Company will make an outfit to use current from electric light wires for $800.

The cost of the electric generator apparatus used at Saginaw, Mich., was between $800 and $900.

The cost of thawing by steam by St. Louis plumbers was $10 to $15. One plumber, for digging up a service, thawing and relaying it, charged for 37 hrs. plumber at $1.25, 69 hrs. helper at $0.75 and for repaving street and city inspection, $9.00; a total of $141.15.

In Lawrence, Kan., with borrowed and improvised outfit the cost of work with current at 10 cents per hour and a minimum at $1 for each connection, 60 cents an hour for man to make connections and two water works employees at 35 and 26 cents an hour, averaged $3.25 per service, 12 services being thawed in a day and 40 services being thawed in all.

In St. Louis County, Mo., the electric light company charged the water company $1 for each connection of current, and 75 cents an hour for man to make connections, and the cost per service thawed averaged $6.58 for some 2,000 frozen.

The Minneapolis gasoline-generator outfit cost $3,100 and the charge per service of $5 for thawing probably met the expenses of doing the work.

OTHER BUSINESS.

In the afternoon of Thursday the principal papers gave descriptions, illustrated by lantern slides, of the very complete systems of plots and records kept by St. Louis and by the Passaic Water Company, showing the more elaborate nature of the records required by a large department, and the extent of the records required for safe and convenient operation of water systems of all sizes.

A. P. Greensfelder, president of the American Society of Engineering Contractors, presented a plea for standard forms of contract and bond, which resulted in a vote to appoint a committee to draft a standard form of contract and bond to report at the next convention.

Mr. Griswold of Paterson, N. J., presented a paper on standardizing post hydrants and hydrant fittings, giving a history of the efforts in this direction by the Fire Prevention Bureau and the National Fire Protection Association, and demonstrating a method of re-cutting 7 and 8-pitch threads with 7.5-pitch die so as to make close fits with the re-cut fittings.

The method of making nominations for office prescribed by the new constitution was put in operation, the various districts making their nominations for the nominating committee: H. Hymmen, Kitchener, Ont., Dist. 1; H. F. Huy, Buffalo, Dist. 2; C. R. Wood, Philadelphia, and E. W. Humphrey, Erie, tie vote, Dist. 3; H. B. Morgan, Peoria, and W. W. DeBerard, alternate, Dist. 4; J. A. Steele, Jr., Vicksburg, Dist 5; John A. Caulfield, Bismarck, N. D., Dist. 6. Under the revision of the constitution, members in groups of 25 signers have the opportunity of adding names to this list in their respective districts by sending their petitions to the secretary within 60 days. The list for each district is then sent to the members in the district for vote, which must be returned to the secretary before noon, Oct. 20. The executive committee appoints the nominees thus selected as members of the nominating committee, deciding any ties which may occur.

The WEEK'S NEWS

Federal Road Aid—Heavy Trucks Barred on New York Highways—Typhoid Reduced by North Carolina—Niagara Falls Raises Water Rates—Police Shake-Up in Richmond, Va.—City Manager of San Jose Resigns—The Six-Cent Fare Situation in New York—Boston Elevated Railroad to Be State Operated—New York Millionaires Fight Over Zoning System.

ROADS AND PAVEMENTS

Federal Approval for $15,000,000 Aid Roads.

Washington, D. C.—In March and April the Secretary of Agriculture, on recommendation of the Office of Public Roads and Rural Engineering, approved 212 state road-building projects involving more than 2,500 miles of highways under the Federal aid road act. The estimated cost of these improvements to the states is about $15,000,000. The Federal aid allowed is more than $5,000,000.

New Law Bars Heavy Auto Trucks.

Albany, N. Y.—Governor Whitman recently signed the Hewitt bill amending the state highway law relating to auto trucks and trailers. A new section (Sec. 282a) is added as follows: "Auto trucks and trailers in excess of twenty-five thousand pounds. After this section takes effect no person shall operate or drive on the public highways of the state outside of cities an auto truck or trailer having a combined weight of truck and load of more than twenty-five thousand pounds, but this section shall not apply to an auto truck or trailer heretofore registered pursuant to section 282 of this chapter having a combined weight of truck and carrying capacity in excess of twenty-five thousand pounds during the period for which such auto truck or trailer shall have been registered or reregistered." The new law went into immediate effect.

Railroad Refuses to Replace Road.

Salem, Ore.—The public service commission has been notified by the Willamette-Pacific Railroad company that the company has appealed to the supreme court from a decision of the circuit court for Lane county requiring the company to build about 12 miles of highway along the north bank of the Siuslaw river. Action was brought before the service commission by the Lane county court and from the commission's order the company appealed to the circuit court which upheld the commission. It is alleged that when the railroad company built its line along the Siuslaw it appropriated about 12 miles of highway, leaving residents of the district without a wagon road.

Enjoiners of Warrenite Road Lose.

Okmulgee, Okla.—Judge Higgins of McAlester, holding court in Okmulgee, decided in favor of the contract and [illegible] a suit brought by certain taxpayers to enjoin the carrying out of a contract awarded in December, 1917, for the laying of [illegible] miles of Warrenite road and [illegible] of [illegible] three miles additional. The [illegible] a bond issue of [illegible] for the improvement [illegible] sold at a premium of $40,000 in [illegible] 1917. The contract was let under plans and [illegible] prepared by Harrington, Howard and Ash, consulting engineers of Kansas City, Mo., and the contract for Warrenite to be laid on a compressed stone base was awarded to the Western [illegible] Co., of Oklahoma City, Okla. The plaintiff [illegible] stubbornly fought every [illegible] jurisdictional and practical questions. Depositions were taken in all sections of the United States, and a large number of experts on both sides gave testimony at the trial, which lasted ten days, including [illegible]. At the conclusion, judge Higgins [illegible] decided against every point raised by the plaintiffs and denied the injunction for which the plaintiffs asked. The roads to be improved connect the cities of Okmulgee, Henryetta, Morris, Beggs, and the surrounding country, which is rich in oil, coal, grazing, and agricultural resources. The heavy traffic accompanying the recent development of these important resources has made the dirt roads nearly impassable.

Big County Bond Issue Carried.

Meadville, Pa.—By almost a two to one vote, Crawford county voters approved a bond issue of $800,000 for improvement of the county's highways at the recent primary election. While the vote was light the issue carried in all parts of the county.

SEWERAGE AND SANITATION

Beautifying Sewage Disposal Plant.

Albany, N. Y.—Under the direction of Philip Bender, superintendent of parks, the city is beautifying the grounds around the sewage disposal plant on Westerlo island. Workmen have been setting out hundreds of Norway maple trees on the grounds surrounding the plant, ivy is being planted around the buildings and beds of shrubs are being set out in various places for the purpose of making the grounds attractive. The idea of improving the grounds originated in city engineer Lanagan's office, and after the subject had been talked over with Charles D. Lay, consulting landscape architect employed by the city, the park department was asked to do the work. With little cost to the city, Mr. Lanagan says, the grounds are being transformed into a place of which the city may well feel proud. "It is one of the public works of the city," said Mr. Lanagan recently' "and it should be placed in such condition as would set a good example for private business plants." The main feature of the improvements that are being made at the plant will be a sunken garden of roses near that part of the grounds where the grit chamber is located. Grass seed has been sown on the embankments and in other places about the plant. "People have had a mistaken idea of what the sewage disposal plant was, and we propose to make it a place that they will visit," said city engineer Lanagan.

Reducing Typhoid in North Carolina.

Raleigh, N. C.—For the four year period including 1914, 1915, 1916, 1917, the death rate in North Carolina from typhoid fever was 30.3. The total number occurring in the state during the four years was 2,909. Due to an energetic educational campaign that has resulted in a general improvement of sanitary conditions throughout the state, and in the immunizing of a large number through the administering of typhoid vaccine, the number of deaths occurring has been reduced each year of the period, falling from 839 in 1914 to 626 in 1917. The death rate from this cause is still very high, and the state board of health is this year undertaking a statewide campaign for the prevention of typhoid epidemics. Not more than 500 deaths in North Carolina in 1918 from typhoid is the goal set, and all the energies of the board will be centered on achieving that result. For the four year period Ashe county leads the state with the lowest death rate from this cause, it being 7.3. Jones county is a close second with a rate of 8.3. Martin county has the misfortune to have the worst record of the 100 counties, having a death rate of 61, with

Perquimans and Lee both crowding it for the place at the bottom of the list with rates of 60.2 and 59.2 respectively. There are 42 counties in which the death rate from this cause is above the death rate for the state as a whole. Included among these are Mecklenburg. Guilford, Forsyth, Wake and Durham counties, which contain five of the largest cities in the state. On the other hand, Buncombe and New Hanover counties, containing the large cities of Asheville and Wilmington, are each well under the state average. In the campaign for the prevention of typhoid fever in the state this year the state board of health will stress three things: The installation of sanitary privies to replace the open back privy which is the favorite breeding place of flies; the destruction of the germ carriers, flies, by destroying their breeding places and screening against their entry into homes; vaccination through local agencies in each county of as many people as can be reached during the year.

City Protests Against Higher Sewerage Rates.

Burlington, N. J.—The Burlington Sewerage Company, taking immediate advantage of the recent ruling of the state public utility commission, by which its franchise is practically called a "scrap of paper," issued bills with an increase of $4 on minimum rates. The increased rate is charged for the last three years, although bills presented during that period have been paid. The minimum rate provided in the franchise was $6. Common council of the city has decided to carry the fight on the new rates to the highest court and has issued a notice to property owners to pay no attention to the new bills. The city has appealed to the Court of Errors and Appeals the recent decision of the supreme court which set aside an order of the public utility commission refusing to grant increased rates to the Burlington Sewerage Company. After the refusal of the commission, the sewerage company appealed to the Supreme Court, which ordered the commission to grant the rates asked for, which was done. In the appeal Burlington declares that the utility commission is without jurisdiction to either increase rates or to grant permission to file new schedules beyond the maximum of rates for service by the sewerage company as fixed in the franchise granted to it, and that the Legislature in 1911 empowered Burlington to fix the maximum rates to be charged by the sewerage company but which have now been set aside.

WATER SUPPLY

Raise Unmetered Rates 25 Per Cent.

Niagara Falls, N. Y.—An increase of 25 per cent. in the city's charge for unmetered water service has become effective and no more applications for unmetered service will be received hereafter. Changes in the schedule of meter rates will become effective July 1st. The new meter rates will be as follows: Less than 20,000 cu. ft. per quarter, eight cents per hundred cu. ft.; 20,000 to 40,000 cu. ft. per quarter, seven cents per hundred cu. ft.; 40,000 to 60,000 cu. ft. per quarter, 6¼ cents per hundred cu. ft.; 60,000 to 80,000 cu. ft. per quarter, 5½ cents per hundred; 80,000 to 100,000 cu. ft. per quarter, 4¾ cents per hundred cu. ft.; 100,000 to 250,000 cu. ft. per quarter, 4 cents per hundred cu. ft.; over 250,000 cu. ft. per quarter, 3 cents per hundred cu. ft. The minimum meter rate will be $1.50 per meter per quarter.

New Filtration Plant Must Replace Old One.

Geneva, O.—Dr. F. C. Smith, village health officer, has received the following letter from state commissioner of health A. W. Freeman:

> On May 16 one of our assistant engineers visited Geneva for the purpose of investigating the condition of the public water supply and water purification plant, and of conferring with the officials of the village regarding improvements.
>
> The water purification plant of Geneva, which was installed in 1902, is one of the oldest operating plants in Ohio. In fact, only three other plants now in operation existed at the time the Geneva plant was installed, and of these two will soon be improved or replaced.
>
> The Geneva plant does not meet the modern standard of design, and is unable to produce satisfactory efficiency in the treatment of the water supply. At the time of the visit it was observed that the filtered water contained a noticeable turbidity, indicating unsatisfactory sanitary quality. Turbidity was also observed in the distributing reservoir and to a somewhat lessened extent in the distributing system.
>
> Although no samples were collected these observations indicated that the effluent of the plant was of unsafe quality, and this department would advise that a warning be issued to consumers to boil all water used for drinking purposes until improvements can be made to insure the delivery of a safe supply.
>
> It is obvious that immediate steps should be taken to provide a new water purification plant. This department is of the opinion that it would be unwise to attempt to repair or extend the present purification devices, and that their abandonment and substitution by a new installation is necessary. We would recommend that plans for the necessary improvements be prepared with the assistance of a competent consulting engineer, such plans to be in accordance with the desires of the village officials and the requirements of the State Department of Health.
>
> This department will be prepared to discuss informally the question of the design of the plant in advance of the formal submission of plans for our approval. After the probable cost of the improvement is determined the council should take action to provide the necessary funds and a contract should be awarded. Owing to the urgency for the improvement of the water supply it is advisable that this matter be given consideration without unnecessary delay.

Approaching Complete Metering.

Spokane, Wash.—Leaving only about three thousand unmetered water services in the city, and increasing the total of metered services to 19,456, the city water division installed 620 new meters during April, according to a report by water superintendent Alex Lindsay. In 1910 only 9.18 per cent of the water services in the city were metered. At the end of 1917 the percentage of metered services was 70.63 per cent. During this seven-year period the water consumption per capita of the city's people, based on the government's estimate as to Spokane's population, was reduced from 314 gallons each day to 137 gallons per day.

FIRE AND POLICE

Shake-Up in Police Force.

Richmond, Va.—Investigation by mayor Ainslie of charges and reports to the effect that certain members of the police department were in collusion with the illicit liquor traffic culminated in the removal of chief of police R. B. Sowell from office and the appointment of captain C. A. Sherry in his place. In a letter to Sowell formally notifying him of his decision, mayor Ainslie made it plain that he did not consider the chief's action had made him guilty of any serious wrongdoing, but his conduct had indicated a clear infirmity of judgment and discretion, and on that account he did not believe him to be the proper man for the head of the department. After taking this action, mayor Ainslie announced that all of the statements made to him by policemen and former policemen bearing on the case would be turned over to the Commonwealth's attorney for presentation to the grand jury. Before removing chief Sowell, mayor Ainslie asked for his resignation, but Sowell refused to comply with his request. The mayor said that he then felt it his reluctant duty to put another man in his place. Chief Sowell had been on the force for twenty-six years, and is said to have never had a charge against him before. His removal will debar him from benefits of the Police Benefit Association.

River on Fire—Firemen Save Munitions.

Kearny, N. J.—Only after a vigorous fight did firemen from Kearny and Newark succeed in putting out a difficult blaze in which the Passaic river was literally on fire, which threatened several big warehouses, including one filled with munitions. A watchman in charge of some barges in the Passaic river near Kearny was startled in early morning when he saw "the river catch fire" and begin to burn brightly within a few hundred feet of the barge on which he was located. The blaze raced across the surface of the river to the barge on which he was standing accompanied by flame and superheated air which singed his hair and scorched his face before he could run to land. He turned in a fire alarm on shore near the spot, and when he looked at the river again two barges were ablaze, and the huge patch of fire on the water was increasing in area, although it had lost the speed which originally carried it along. The fire burned the hawser ropes of two work barges, each equipped with derricks and with two scows. They floated into the river ablaze, and drifted slowly down steam until they lodged against the Pennsylvania freight bridge across the Passaic river [illegible], setting fire to some piles and ties in the structure which was built mainly of concrete and steel. Those who saw the strange sight before the firemen arrived diagnosed it as a blaze of mixed chemicals and gases on the surface of the water. The river is the receptacle for the waste of many industrial plants, and often accumulates a thick film of oils, creosote, sawdust, and refuse of various sorts, overhung with a collection of mixed gases from chemicals. When the tide sets inshore the river takes on its thickest coat of combustibles. The watchman said that the blaze seemed to start in mid-stream, out of reach of sparks from chimneys, so that the original blaze may have been spontaneous. When the Kearny fire department arrived, joined later by apparatus from Newark, they put out the fire where it had reached wooden wharf structures and started to fight the blaze on the Pennsylvania freight bridge, where they prevented serious damage. Chief Charles Greenfield, of the Kearny department, commandeered two fireboats which were undergoing repairs some distance from the fire, and used them to save the remains of the barges. In the meantime the fire continued to burn on the surface of the river, and no attack was made on it, as no method was known for stopping a blaze of this novel character. Shortly after daybreak, however, the fire-fighters got a scare when they saw the fire fed by the scum on the stream eating its way slowly toward a part of the shore on which a storehouse of the American Can Company and a lumber yard were situated. The storehouse was known to be filled with munitions, some of which were believed to be explosive. Most of the fire apparatus was shifted to play on these threatened spots. The floating blaze advanced slowly toward the lumber yard and storehouse for about an hour, then suddenly halted and began to retreat. The tide had suddenly turned and was carrying it in the other direction. After that the area of fire slowly contracted, finally began to flicker, and died out.

Surrounding Towns Help Fight Lumber Blaze.

Minden, La.—The Minden Lumber Company's plant, dry kilns and lumber in the yards were almost completely destroyed by fire, with a loss estimated at from $300,000 to $400,000. The fire started in the sawmill, and spread to the dry kilns and the yards. The flames raged from about 9 p. m. until midnight, when they were gotten under control, but not extinguished. The fire department, mill fire apparatus, the help of hundreds of citizens, and the aid of fire apparatus from surrounding towns joined in the fight on the conflagration. The Shreveport fire department sent a wagon and pumping apparatus with ten men under direction of captain Sawyer over the Cotton Belt railroad. The tramway was cut in half in an effort to stop the flames. Hundreds of men worked futilely to clear stacks of lumber away in time to stop the spread of the fire. The plant was one of the best equipped in the state, and employed several hundred men. No one was hurt.

Seven Firemen Hurt in Aeroplane Factory Blaze.

San Francisco, Cal.—A big fire resulted in a loss of nearly $1,000,000 in the Mission district when flames swept through the plant of the Fowler Aeroplane Corporation and reduced three other factories and nine flat buildings to ruins. About 175 persons were driven from their homes. The cause of the fire could not be determined. From a government viewpoint the most serious loss was the burning of ten aeroplanes ready for shipment to United States Army schools. The planes were valued at about [illegible]. Still more serious was the blow to the government aviation program resulting from the loss of thousands of feet of the precious spruce timber used exclusively in the most vital parts of the aeroplane. Within an hour after the fire broke out the government had taken charge. As nearly as could be determined the fire began on the top floor of a showcase factory adjoining the aeroplane factory. Before the first of fire apparatus appeared the showcase factory was in full blaze, fanned by a strong [illegible] breeze. A freak change of the breeze shot a bank of [illegible] the aeroplane factory, and in less than a minute the plant was in flames. So quickly did the flames spread that the plants of two other showcase factories together with a row of nine flats seemed to break into flames simultaneously. Second and third alarms were rung in, and fire chief Thomas R. Murphy assumed personal charge of the fire fighting. The chief was burned about the face, and six other firemen were injured by flames and falling timbers.

GOVERNMENT AND FINANCE

Women Vote in Unfavorable Commission Election.

Poughkeepsie, N. Y.—At a special election the proposition to adopt the plan "C" commission form of city government was defeated by a majority of 170. There were 1,635 votes cast in favor of the plan and 1,805 against. About 600 women voted.

City Employees Get Higher Salaries.

Pekin, Ill.—The petition of the city employees for an increase in salaries has been granted by the city council. The policemen will get $10 per month more, and the firemen, chief of police, city clerk, corporation counsel and city treasurer will get an increase of $15 per month. The salary of the call firemen will remain the same, but two more will be appointed. The increase for the street railway employees will be taken care of in a separate resolution. The salaries fixed by the new ordinance are as follows: Chief of police, $1,200; city treasurer, $1,400; city clerk, $1,200; chief of fire department, $1,200; corporation counsel, $1,320; superintendent of streets, $1,080; policemen, $960; firemen, $960; bridge tenders, $750. The increase in salaries will mean an additional expenditure of about $5,000.

Manager Reed of San Jose Resigns.

San Jose, Cal.—Thomas H. Reed, who has been city manager for two years, has resigned. Manager Reed had previously been a professor of economics at the University of California, and had maintained a bureau of municipal experts. He had been employed, by public subscription, to draft a city manager charter for the city, for which he received $1,000. When the voters approved the charter the council selected Reed as manager at a salary of $6,000 a year. The immediate circumstances preceding the resignation were the small majority, 3,352 to 3,211, given against an ordinance which would have limited candidates for the managership to those with a five years' residence qualification. This was opposed by manager Reed. The administration's request for a increase of 15 cents in taxes was voted down, and a measure to increase the salaries of policemen and firemen, opposed by the administration, was approved by the voters. The city manager's resignation was accepted to take place on or before August 1, 1918, and he was granted a fifteen-day leave of absence, dating from May 31. The city engineer, assisted from time to time by the individual members of the council, will transact the business of the city manager's office in his absence. In his letter of resignation, manager Reed says:

> My primary motive in accepting the position of city manager was to play a part in the establishment of the city manager form of government in this country. I have now seen the success of the city manager form of government demonstrated by its accomplishments in San Jose, and doubly proved by the persistent opposition of those political elements whose control of this city it has effectually displaced.
>
> No man has ever been so fortunate as to lead in the moral cleansing or political regeneration of any community without becoming a shining mark for ridicule, abuse and misrepresentation. I expected nothing else, and I would be prepared to go on with the struggle here indefinitely were it not that circumstances beyond the control of the manager and council have made it certain that further sacrifice on my part would be futile for reasons fully explained in the accompanying statement. Furthermore, continued controversy with my fellow citizens is peculiarly intolerable to me in the critical situation in which our beloved country now stands. I have, therefore, made final arrangements to return to the University of California and to take up actively again the practice of law with my former associates, the firm of Haven & Athern in San Francisco.
>
> The issues of the five-year ordinance having now been favorably decided, and with the full assurance of the continued support of the majority of the council, I feel that I am now free to follow my own interests in this matter.

In a statement of the situation of finances accompanying the resignation, manager Reed says in part:

> The past two years have given ample proof of the validity of the principles underlying the charter of the city of San Jose. Centralized power and responsibility, modern financial methods and the merit system of appointment have produced, as was expected by the advocates of the new charter, an honest and economical administration free from the taint of partisanship.
>
> The work of the health department has been made vastly more effective than ever before in the history of the city. Even the strongest critics of the administration admit that the fire department is better than it has ever been, and the results in the low percentage of loss from fire prove this fact beyond the peradventure of doubt. Our parks, streets and buildings have been maintained in an improved condition, and may be favorably compared with any period in the past.
>
> The methods of the police department have been modernized. The city is now in a cleaner condition morally than ever before. We no longer have a single open house of prostitution, and our last saloon has gone.
>
> Public utilities, especially the street railway company, have been brought to fulfill all their obligations to the city. Upwards of $12,000 has been expended upon permanent public improvements, especially the filter at Alum Rock park bathhouse, the concrete culvert under Pierce avenue and Orchard street, and the Willow street bridge without increase of indebtedness. An almost equal sum has been expended upon permanent equipment in the fire department.
>
> The indebtedness of the city is less and the tax rate less than it was two years ago. The fact that $23,000 clear balance existed in the treasury December 1, 1917, a situation previously unheard of, demonstrates that economy has kept pace with energy in the present administration. Whatever financial emergency arises in the future can be met in the light of the full facts supplied by our modern accounting system instead of groping in the dark as would have been the case under the old methods.

After referring to the increased costs of operations and salaries due to the war the statement continues:

> Not only have we had to face the conditions produced by the war, which affect the city as they do every other business concern, but the people of the city of San Jose have imposed upon us other difficulties for which the city administration is no wise responsible. On the 1st of January by reason of a popular decision, which I, myself, consider to have been wise, saloons ceased to exist in San Jose. San Jose is undoubtedly a cleaner and better city as a result. The benefits of the no-saloon policy, however, have not found their way into the city treasury, and we are running the city this year upon a revenue $40,000 less than last year because of this change. For this year this loss of revenue has in part been taken care of by the $23,000 balance resulting from our economy and care of the year preceding.
>
> By the election of the 6th of May the people voted additional increases to the policemen and firemen, aggregating $785 a month, or $9,420 a year, upwards of $5,000 for the balance of this fiscal year. If, as should be done in order to preserve the efficiency of the departments, the pay of older employees and superior officers is correspondingly scaled up the increase per annum will total nearer $15,000. At the same time that these obligatory increases of pay were adopted the people voted down the proposition to increase the taxes by 15 cents.
>
> The situation thus created stands as follows: The budget for this fiscal year was narrowly and carefully figured, and the auditor's report, which is presented to the council tonight, shows that we are running very close to the narrow line of safety which it left. There is nothing about the situation presented by this report which need be alarming for this fiscal year were it not for the obligatory increases in pay. We are still within the proportion of our appropriations, and the revenues promise to be practically 100 per cent. There is, however, no margin out of which the increases of pay can be provided, and when the fiscal year begins there will be no material balance, and the full effect of the $40,000 loss of revenue will be felt.
>
> There are two ways in which the situation created by the votes of the people can be met. The first of these is by reducing the expenditures, which means that the city must discharge employees or refrain from doing work that has been contemplated.
>
> The total current expense budget of the city is only about $312,000, and such action must be drastic indeed to make up nearly one-sixth of that amount—$40,000 loss of revenue and $10,000 of obligatory expenses.
>
> The other method of meeting the situation is by an increase of income. All possibility of such an increase by taxation has been eliminated by vote of the people. The only recourse open that can help this or next year's situation is a system such as obtains in Fresno of business licenses levied upon the merchants and other business men of the city. Either course will bring criticism that will be unjust because it will be undeserved. You will necessarily be involved in a kind of controversy especially irritating to broad-minded, patriotic men in this hour of the nation's supreme emergency. Into this situation you have been forced by the indifference of the public and the machinations of a few selfish politicians who need assume no responsibility for their conduct.

TRAFFIC AND TRANSPORTATION

Commission Turns Down City's 3-Cent Fare Request.

Hoboken, N. J.—The state board of public utilities commissioners at Trenton recently dismissed the request of the city of Hoboken, which was filed on March 26, 1913, asking that the fare of the Public Service Railway there be reduced from 5 cents to 3 cents. The original petition applied to only two lines, but on October 1, 1915, an amended petition was filed making the petition applicable also to other lines in the city. The petition alleged that the 5-cent rate of fare was unjust and unreasonable, and that a 3-cent rate would be just and reasonable. After declaring that the city of Hoboken failed to sustain its allegations the report of the board says: "A satisfactory conclusion even after a complete analysis of the testimony is impossible because of the confused state in which it was presented. Much of the testimony offered by various witnesses was subsequently withdrawn because of inaccuracy. Many of the elements necessary to a proper appraisal were disregarded, and it would seem that no genuine attempt had been made by any of the witnesses to ascertain any proper allocation of the passengers, revenue therefrom, or operating expenses to the city of Hoboken which would justify the board in making any determination as to the merits of the application."

Six-Cent Fare Change Postponed—Cities Fight.

Albany, N. Y.—The Public Service Commission for the Second District has ordered the suspension of the operation of the tariff schedule of the United Traction Company which was filed with the commission on May 2. The commission's order directs the suspension of the new rates until Sept. 29, and it will order a hearing concerning the proposed increased fares. The new schedule provided that a rate of 6 cents was to be charged for one continuous ride between Albany and Rensselaer, and that transfers were only to be issued within the "Albany-Rensselaer Through Zone." The cities have decided to fight the increase. Mayor McIntyre, of Rensselaer, through corporation counsel Ernest L. Boothby, filed an objection to the proposed schedule on the grounds that the rates contained therein, as far as Rensselaer is concerned, were "unlawful, excessive, inequitable and discriminatory." Mayor McIntyre contended that the United Traction Company was prevented, by statutory limitations, from increasing the rate of fare or changing the system now governing the issuance of transfers. Under the regulations which have been in force the rate of fare between points in Albany and Resselaer is fixed at 5 cents, with the privilege of transfer to points within the lines operated in the two municipalities. At a recent conference of officials representing Albany, Rensselaer, Troy, Watervliet, and Cohoes it was decided best to have each city and community affected by the new rate schedule conduct its own case, as the conditions are different.

State "Operation" for Boston Elevated.

Boston, Mass.—Governor McCall has finally signed the much-discussed bill placing the control of the Boston Elevated Railway in the hands of a board of five public trustees, to be appointed by him. According to the law the trustees will have power for ten years to regulate service and maintain a flexible fare system without any supervision from state regulatory bodies. The board will manage and operate the property, adjust rates of fare to cover the cost of service, including specified dividend payments on the company's stock, and make improvements to the property. The trustees may appoint and remove the officers of the company, except the directors. The legislature may terminate the period of state operation at any time after 10 years, on two years' notice. It is provided that the company shall raise $3,000,000 by the sale of preferred stock, $1,000,000 of the proceeds to be used as a reserve fund for fare regulation and $2,000,000 for improvements. The state will have the option of buying the property at any time by assuming the liabilities and reimbursing stockholders for the amount paid in. Dividends on the company's common stock are fixed by the act at 5 per cent during the first two years, 5½ per cent during the next two years, and 6 per cent thereafter, payable quarterly. The dividend rate on this preferred stock is to be fixed by the stockholders voting the issue, but may not exceed 7 per cent (cumulative preferential). The act is to become effective upon its acceptance by the holders of not less than a majority of all the stock of the Boston Elevated Railway and of the leased West End Street Railway, and also upon the filing of a certificate that the entire $3,000,000 above mentioned has been subscribed for and at least 30 per cent paid in cash by each subscriber, and that no dividends have been declared or paid upon common stock since the passage of the act. The vote of the company will constitute an agreement to sell to the state or to any political division thereof, at any time during the period of public operation. The purchase price is to be equal to the cash paid in by stockholders for stock outstanding, and the company's current liabilities are to be assumed. Rates of fare are to be changed by the trustees whenever at the end of a quarter the reserve fund is found to be below 70 per cent or above 130 per cent of the original amount. When the reserve fund is insufficient to meet an operating deficit incurred, the state treasurer shall pay the difference and shall assess it upon the cities and towns in which the company operates.

MISCELLANEOUS

Millionaires Fight Over Zoning Law.

New York, N. Y.—The Board of Estimate has attempted to reverse the recent action of the Board of Standards and Appeals in authorizing Baron William Waldorf Astor to erect a business building on the Astor property on Madison avenue, between Thirty-fifth and Thirty-sixth streets. Representatives of J. P. Morgan and the Murray Hill Association have sought to keep the section restricted to residential use, and recently the committee on city planning and public improvements, of which borough president Frank L. Dowling is chairman, reported in favor of such restriction. Mr. Dowling presented his report denying the petition of Baron Astor, and demanded to know whether or not the Board of Estimate had full jurisdiction over the matter, or whether the action of the Board of Standards and Appeals was final. He explained that his committee is charged with investigation of all applications for changing sections of the city from residential to unrestricted business districts, and is supposed to safeguard the homes of city residents from invasion by garages, factories, mills and generally undesirable neighbors. The borough president said:

"If zoning restrictions imposed by the Board of Estimate can be upset and defied at will by the Board of Standards and Appeals this board might just as well abandon its attitude of jurisdiction over the character of buildings to be erected in various parts of the city. The Board of Estimate has twice disapproved of the application of Baron Astor to invade this residential section in Madison avenue." The borough president suggested that the Board of Estimate sustain his report and refer the matter to the corporation counsel for an opinion as to what steps could be taken to nullify the action of the Board of Standards and Appeals, and this was done. The Board of Standards and Appeals had granted the appeal of Henry W. Taft, who appeared for Lord Astor, for permission to erect a seven-story business building. The only condition imposed was that the architectural and structural treatment of the exterior of the building be in keeping with the present development of Madison avenue. "The plans," said Mr. Taft, "call for a handsome seven-story modern structure, 120 feet in height, which has been approved by the Superintendent of Buildings and will be used for high-class business purposes. The present residential neighborhood will not be affected any more than it is at present, as practically on all the side streets buildings have been and still are being converted for business occupancy. The question is whether you deprive the city of an ornamental improvement and all the incidental additional revenue for the benefit of an owner across the street." It is expected that the fight between these two powerful interests will result in a legal test of the constitutionality of the law. Since the decision of the Board of Appeals is final in so far as the city authorities are concerned, Mr. Morgan's lawyers must go to the courts for redress. They may raise the question of the authority of the Board of Appeals in the premises because it is the creature of and therefore subordinate to the Board of Estimate, the real governing body of the city of New York. According to the "zone resolution" the Board of Appeals, although removable by the mayor at his pleasure, has the last say in all matters appertaining to the zoning law, provided no change in the map of the city is involved. Lord Astor owns the whole block—Madison avenue frontage is in question. It is bounded by Fifth avenue, Thirty-sixth street, Madison avenue and Thirty-fifth street. He alleges that the value of this plot is greatly reduced owing to the fact of its frontage on Madison avenue being placed in a residence district. He desires to put up a business structure there to take the place of a row of old-fashioned brownstone front dwellings which can no longer be rented profitably. They are said to be boarding and romoing houses not of the highest type. It is generally believed that a determined attack is about to be made on the constitutionality of the whole zoning law on the ground that it is arbitrary and exceeds the police powers of the state in that it takes the control of property away from the rightful owner without due process of law. Friends of the zone law realize that this is its weak spot and had hoped that a test case might be made of a decision by the local authorities involving interests less prominent than Morgan and Astor. In the two years of the existence of the zoning law its constitutionality has never been on trial. Decisions have been rendered by the courts concerning the zoning regulations, but always on points not related to the main issue.

Case Against City Seizing Coal Dismissed.

Lima, O.—The injunction proceedings against the city officials charged with seizing coal from the railroad cars during last winter's famine have been dismissed, with consent of the United States District court for the northern division of Ohio, at Toledo by the Baltimore and Ohio railroad. The railroad was granted a temporary injunction when the case was filed and hearing on its application for a permanent injunction restraining the city from the practices complained of was to have been heard last month. Melvin Light, city solicitor, has been conferring with railroad officials for several months to reach a settlement, with the result that the plaintiffs agreed to dismiss the action. Mayor Bailis Simpson, Oscar Roush, chief of police, John Herholtzheimer, market master, and Julian Pape, assistant market master, were named in the action. The case was an outgrowth of the seizure of forty-eight carloads of coal from the B. & O. yards and from trains. The seizures began early in the winter and continued up until December 13. A few days later the suit was filed and an injunction asked. Most of the seizures were attended by frequent clashes between armed representatives of the city and railroad officials and employes. The first seizure occurred early in October and was only accomplished after a clash in which the city blocked the north and south main lines of the railroad for two hours, tying up a number of trains. Locomotives were commandeered by the city, their crews placed under arrest with orders to operate the engines, and train crews recruited from city officials. In the suit before the U. S. district court, which was heard by Judge John M. Killits, of Toledo, the city officials presented as their defense the intense suffering in Lima due to the lack of coal and the inability of the city to obtain supplies through regular channels. Voluminous correspondence with state and federal fuel dictators in which the coal controllers confessed they were unable to relieve suffering here, was placed on record. In spite of the city's defense, however, the officials were severely censured by the court for "high-handed interference" with interstate commerce. Mayor Simpson has never been able to settle for all the coal seized. Of the forty-eight cars taken, twenty-eight were the property of the railroad, and settlement was easily made. Owners of the other twenty cars, however, have never presented bills, and in the meantime the mayor is holding their money in a special banking account here. The forty-eight cars contained about 2,000 tons of coal, which brought about $18,000 when sold by the city. Present indications are that the city will come out about even on the deal, the coal having been sold at as near the actual cost as it was possible to fix the price without exact prices on each car seized.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

June 13, 14.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, T. C. Martin, 33 West 39th St., New York City.

June 11-13.—MAYORS AND OTHER CITY OFFICIALS OF NEW YORK STATE. Annual conference, Newburgh, N. Y. Secretary, William P. Capes, 25 Washington St., Albany, N. Y.

June 19-21.—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual meeting, Atlantic City, N. J.

June 19, 20.—LEAGUE OF TEXAS MUNICIPALITIES. Sixth annual convention, in cooperation with the Texas Commercial Executives' Association, San Antonio, Tex. Secretary, Edward T. Paxton, University of Texas, Austin, Tex.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual meeting, Northwestern University, Evanston, Ill.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

American Association of Engineers.

The joint convention of the American Association of Engineers and the Committee on Engineering Co-operation, held at the City Club, Chicago, May 14, with about 150 delegates from national, state and local engineering societies, had for its main subject the service of the engineer in war-time. The association, which has more than 2,500 members, and is composed of civil, electrical, chemical and other engineers, was formed "to raise the standard of ethics of the engineering profession and to promote the economic and social welfare of engineers." It follows non-technical lines.

At the dinner meeting, which followed the day sessions, the following officers were elected: President, W. H. Finley, chief engineer, Chicago & Northwestern Railroad; first vice-president, H. W. Clausen, Chicago; second vice-president, L. K. Skinner, president, L. K. Skinner Engineering Company, Chicago; directors: Harold Almert, J. N. Hatch and J. H. Prior, all of Chicago; T. M. Chapman, Savannah, Ga.; F. K. Bennett, Minneapolis, Minn., and Alexander Potter, New York. Glenn F. Vivian, C. A. Gaensslen and J. T. Mullen were elected members of the national auditing board.

Following the opening address by the president, Edmund T. Perkins, and the address of welcome by John E. Ericson, city engineer of Chicago, the meeting was divided into five sections, which held simultaneous sessions during the morning and submitted resolutions for consideration by the meeting as a whole during the afternoon session. These sections, with their chairmen, were as follows: Work of engineering societies and the licensing of engineers, W. D. Gerber; publicity given to the profession by its activities in the war, Fred R. Low, the editor of "Power"; engineering employment and the supply of technical men for war work, W. H. Finley; engineers' assistance in distribution and conservation of coal, G. W. Heald; standardizing engineering education, Professor R. C. Yeoman.

Besides the several resolutions there was presented a summary of returns from sixty-three engineering societies with a total membership of 30,920, to which had been submitted a questionnaire. The returns indicated that the number of engineers in active military service represents 15 per cent.; that 10 per cent. still desire to enter military service, and that 50 per cent. are available for emergency government work. The general opinion is that the status of the engineer will be better after the war; that the demand at present is primarily for engineers in positions below that of assistant engineer, many war industries suffering from lack of this class of men. It was the sentiment of all societies that the technical profession is paid 50 to 75 per cent. too low. Generally the societies favored licensing engineers, especially if license laws are made uniform and the laws be just. They were unanimous in opposing a shorter course in engineering training, an exception being that shorter courses might be allowed for those desiring to enter war service. The majority of the societies favored standardizing engineering courses so as to obtain uniformity throughout the country, although individual specialization should not be interfered with.

In the afternoon there was a warm debate on the projected organization of the American Academy of Engineers, the plan of which is set forth by a bill which has passed the senate and is before the house of representatives. The association made the project one of the subjects of its first referendum ballot and the academy was disapproved by an overwhelming vote. J. A. L. Waddell, one of the projectors of the plan, was to have presented a paper on the subject, but was not present, and his paper, a defense of the proposed academy, was read by Hunter McDonald, of Nashville, Tenn., the latter being one of the few named as charter members of the academy. Much opposition was voiced, and but little said in favor, but no action was taken other than deciding to take the referendum vote over again for the reason that the first ballot had not stated both sides of the case. The academy as projected will have only 200 members, and the proposition was characterized as creating a caste of engineers, as undemocratic and as un-American.

Organization and co-operation were considered mainly in regard to engineering societies. National organization of engineers was the subject of

(*Continued on page 480.*)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

A big CONCRETE RESERVOIR is to be built by Perth Amboy, N. J. The engineer for the improvement is George A. Johnson.

Scobey, Mont., is to build WATERWORKS, plans for the improvement having been completed by the engineer, W. B. Saunders.

Santa Cruz County, Cal., is to build LEVEES to protect Watsonville City. The engineers for the work are the firm of Haviland & Tibbetts.

Dallas, Tex., confronted by a number of difficult and urgent TRAFFIC and TRANSPORTATION problems, has retained John A. Beeler as expert to investigate and report on improvements.

WATERWORKS IMPROVEMENTS, including a reservoir and a filtration plant, are to be made by Highland Park, Mich. The consulting engineers for the work are the firm of Hoad & Decker.

A WATER SUPPLY SYSTEM is to be built by Poteau, Okla. The engineer for the work is H. A. Pressey.

Bonds have been voted by Newcastle, Wyo., for a WATERWORKS SYSTEM, plans for which are being prepared by the engineer, R. D. Salisbury.

West Virginia is to build a SEWAGE TREATMENT PLANT at its state hospital at Weston. The consulting engineer for the improvement is C. E. Collins.

The municipality of Lima, Peru, has retained George C. Bunker, in charge of water purification for the Panama Canal, to investigate the WATER SUPPLIES now in use and those available for future use.

The Port Commissioners of New Orleans, La., are to build LOCKS to connect the Mississippi river with the proposed industrial CANAL. The engineering firm of George W. Goethals & Co. is planning the development.

INDUSTRIAL NEWS

Cast Iron Pipe.—The new government prices announced recently are now being quoted and will probably remain effective. Quotations: Chicago: 4-inch, $63.35; 6-inch and larger, $60.35; Class A $1 extra. Birmingham: 4-inch, $58; 6-inch and larger, $55; Class A $1 extra. New York: 4-inch, $64.35; 6-inch and larger, $61.35; Class A $1 extra.

Army Orders 8,000 More Trucks.—Orders for 8,000 motor trucks for the use of the United States army have just been placed by the Motor Transport Service. These trucks, designated as "Class B Standard," will have a capacity of from three to five tons. They will be distributed as needed through the various branches of the army. Ten thousand of these Class B standardized trucks have previously been ordered and are now in process of manufacture and delivery.

Sixteen companies are expected to share the order, fifteen having already signed contracts. They are: Gramm-Bernstein Motor Truck Co., Lima, O.; Kelly-Springfield Motor Truck Co., Springfield, O.; Indiana Truck Corporation, Marion, Ind.; Service Motor Truck Co., Wabash, Ind.; Republic Motor Truck Co., Alma, Mich.; Selden Truck Co., Rochester, N. Y.; Bethlehem Motor Corporation, Allentown, Pa.; Diamond T. Motor Co., Chicago, Ill.; United States Motor Truck Co., Cincinnati, O.; Brockway Motor Truck Co., Cortland, N. Y.; Healy Motor Corporation, Moline, Ill.; Sterling Motor Truck Co., Milwaukee, Wis.; Garford Motor Truck Co., Lima, O.; Packard Motor Truck Co., Detroit, Mich., and Hurlbert Motor Truck Co., New York City.

These companies will do assembling work chiefly, parts having been ordered from other concerns, and will receive an assembling price of $567 per truck. They are to complete deliveries between August 1 and December 1.

Indiana Limestone Production in 1917.—The total value of Indiana oolitic limestone sold in 1917 was $3,384,110, a decrease of $96,415, or nearly 3 per cent, compared with 1915, according to figures compiled under the direction of G. F. Loughlin, United States Geological Survey, Department of the Interior, in co-operation with the Indiana Limestone Quarrymen's Association. This value, however, was greater than that for any preceding year except 1912.

Almost the entire value in 1917, as in previous years, was represented by building stone.

The total quantity of building stone sold in 1917 was 6,770,645 cubic feet, valued at $3,261,107, a decrease, compared with 1916, of 23 per cent in quantity and nearly 4 per cent in value, the average price increasing [illegible] cubic foot. Rough [illegible] sawed stone amounted to 4,806,850 cubic feet, valued at $1,631,297 in 1917, a decrease of about 18 per cent in quantity, but an increase of 19 per cent in value, the price per cubic foot rising from 23 to 34 cents. Dressed or manufactured stone amounting to 1,763,795 cubic feet, valued at $1,629,810, decreased 34 per cent in quantity and nearly 20 per cent in value, the price per cubic foot increasing from 75 to 92 cents.

Crushed stone, mostly for road metal, came largely from the Mitchell limestone, which overlies the oolitic stone, and amounted in 1917 to 93,086 short tons, valued at $62,698, and fluxing stone amounted to 47,439 short tons, valued at $10,163. These, with smaller quantities of riprap and stone sold to sugar factories, glass factories and for agricultural use, reached a total of 210,326 short tons, valued at $123,003, a decrease in quantity of 0.9 per cent, but an increase in value of 41 per cent, the average price per ton rising from 41 to 58 cents.

NEWS OF THE SOCIETIES

(Continued from page 479.)

several plans presented by Gardner S. Williams, consulting engineer, Ann Arbor, Mich., C. E. Drayer of the Committee on Cooperation, and by Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis Ry.

Universal military training was indorsed. Employment of technical men for government service through the free "Public Service Reserve" established by the United States Department of Labor was urged.

Desirability of the establishment of a code of ethics was brought up in a letter from Morris L. Cooke, Philadelphia, and Isham Randolph was requested to prepare such a code.

Society for Electrical Development.

The annual meeting of the Society for Electrical Development, Inc., was held May 14 at the offices of the society in New York City, James R. Strong presiding. General manager Wakeman read his annual report, reviewing the work of the society during the past year and suggesting activities for the coming year. The following officers were elected: For directors to represent central-station interests—J. E. Montague, four years; W. W. Freeman, two years; E. N. Sanderson, one year. For directors to represent manufacturing interests—L. P. Sawyer, four years; W. D. Steele, one year. For director to represent jobbing interests—Fred Bissell, four years. For director to represent contracting interests—G. M. Sanborn, four years.

At the board of directors' meeting, which followed the annual meeting, with J. E. Montague presiding, it was decided to continue the work of the society for another year upon the present basis and to conduct a "Convenience Outlet" campaign as suggested by the general manager. An appropriation was made to carry on the campaign along national lines, similar to the "Wire Your Home" and "America's Electrical Christmas" campaigns.

The society will issue broadsides, booklets, folders, lithographed posters, etc., and will ask local committees to procure the co-operation of the entire electrical industry in educating the public to an appreciation of "Convenience Outlets" of all kinds, such outlets to be preferably on a separate circuit from the lighting. It is felt that the time is opportune for such a campaign, when domestic servants are scarce and people have money to spend upon appliances, the proper use of which plays an important part in fuel conservation.

Henry L. Doherty was again elected president. Joseph E. Montague was elected to succeed W. H. Johnson as vice-president and as a member of the executive committee. Gerard Swope was elected chairman of the executive committee. James W. Wakeman was reappointed general manager, and James Smieton, Jr., secretary-treasurer for the ensuing year.

Southeastern Sanitary Association.

The Southeastern Sanitary Association held its recent meeting at Knoxville, Tenn. The association chose R. L. Carlton, M. D., health officer of Winston-Salem, N. C., as president for the ensuing year and Rome, Ga., for the next annual session in May.

Other officers named were Clarence E. Smith, Greenville, S. C., secretary-treasurer, and vice-presidents, Tennessee, Dr. R. C. Smith, Newport; North Carolina, J. H. Epperson, M. D., Durham; South Carolina, Davis M. Furman, Greenville; Georgia, V. H. Bassett, M. D., Savannah.

The association will hereafter publish an annual bulletin.

Highway Traffic Association of New York.

A public meeting of the Highway Traffic Association, of the State of New York, will be held in the grill room of the Automobile Club of America, 247 West 54th street, New York City, at 8:30 p. m., on Wednesday, June 12.

Gen. Francis V. Greene, George H. Pride, members of the Highways Transport Committee of the Council of National Defense; William A. Bassett, of the Bureau of Municipal Research, of New York City, and Joseph K. Orr, president, New York Team Owner's Association, will speak on the topic, "Should Unnecessary Obstructions and Pavements Full of Holes on New York City's Main Commercial Traffic Streets Be Tolerated During the War?" The addresses will be followed by a general discussion.

Dinner at $1.25 per cover will be served in the grill room at 7 p. m. All are invited to both the dinner and the meeting. Any one wishing to attend the dinner should notify the secretary, Elmer Thompson, 247 West 54th street, New York City.

Municipal Journal

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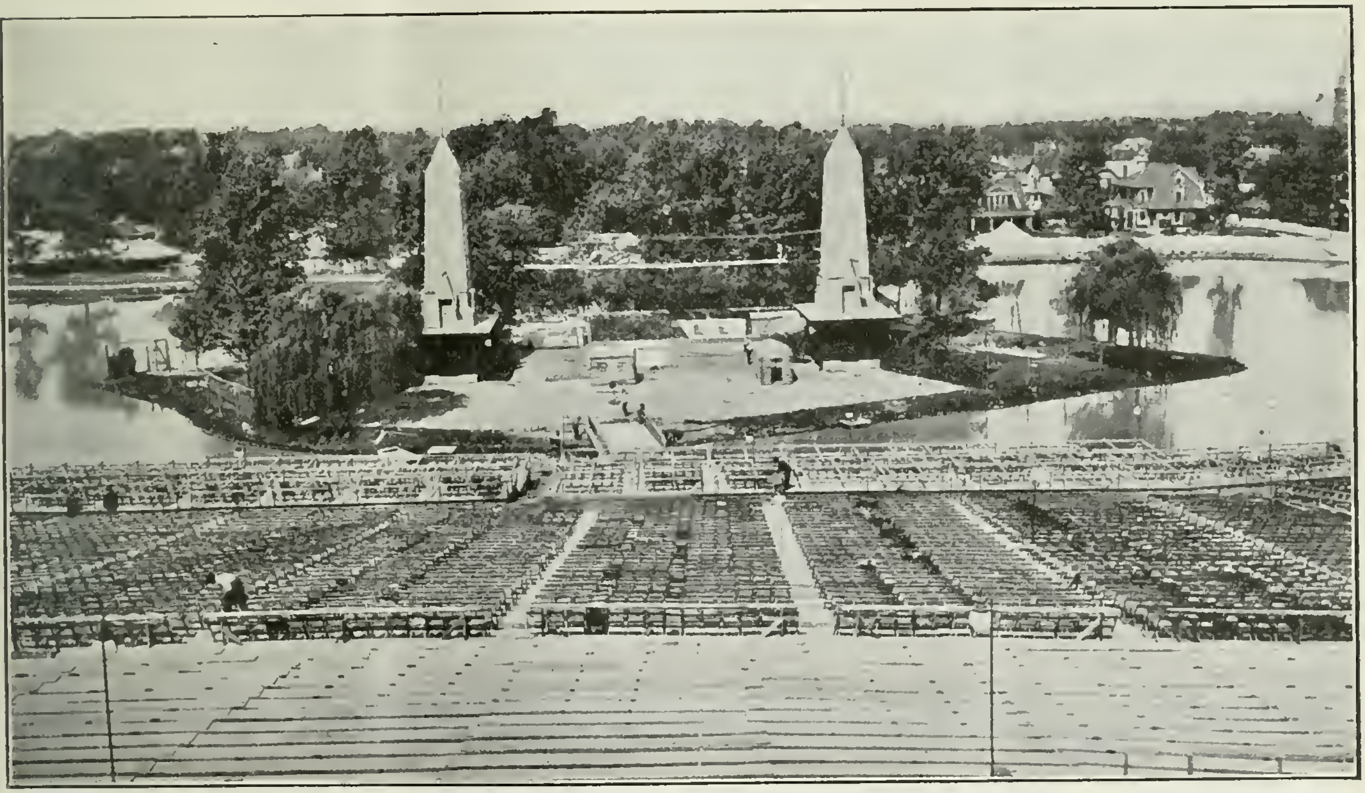
WATER WORKS PARKS IN FORT WAYNE

Properties on Which Are Located Reservoir, Pumping Station, and Well, Used for Park Purposes, for Skating and Other Uses—Water and Park Departments Cooperate in Their Maintenance.

By R. D. EVANS.*



AMPHITHEATER AND STAGE OF FORT WAYNE'S INDIANA CENTENNIAL CELEBRATION (1916) AT RESERVOIR PARK

The Fort Wayne, Indiana, water works is about forty years old and has been built up and added to as the city has grown. A considerable area of the land in which the several stations are located has been developed for public use as parks and playgrounds, the Park Department and the Water Works Department co-operating in such development. No general plan has been followed in this co-operation between the two departments, but each problem has been solved as it has arisen.

The reservoir, which is located in grounds having an area of thirteen acres, is used as a reserve supply of water for fire protection and to equalize pressure on the mains. It is provided with an overflow which discharges into a small lake of about four acres. This is used for skating in winter and, as it is only two or three feet deep at any place, it makes an ideal lake for this purpose. The Park Department has charge of this and pays for scraping off snow, while the Water Works Department floods the surface of the ice when it freezes rough, making no charge for water or labor as it takes very little time or water to put the lake in condition for skating.

There are two other parks (not connected with the Water Works Department) which have lakes and which are handled in the winter in the same manner.

Our No. 1 Pumping Station was the first one installed, and the ground south of it was purchased some years later for park purposes. Since then more ground has been purchased from time to time until at present the City Light and Power Co. (a municipal corporation), the city greenhouses and Forestry Department, a municipal swimming pool, and the pumping station, are all

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*Secretary of the Fort Wayne Water Works.

SKATING ON LAKE AT LAKESIDE PARK.

included in this one park, which covers in all about thirty-two acres. This the Park Department keeps sodded and beautified with trees, flowers, etc. The portion of this ground on which the Water Department has its wells and pumping station is owned by the Water Works Department, while other parts are owned by the Light and Power Department, the city swimming pool and the Park Department.

No. 2 Pumping station is located on the banks of the St. Mary's river, and the Water Works Department owns considerable ground on both sides of the river, which was purchased for the purpose of sinking wells. That portion of the water works ground lying east of the river has been utilized as a children's playground, and the grounds are cared for by the School Board of the city. A number of wells are located on this side, but the playground has been so arranged that they do not interfere with the grounds. There are about two acres lying just north of this station, which until this year were never utilized, but this spring the ground was turned over to the Liberty Garden Committee by the Water Works Department and is now planted and cultivated by different people who obtained their permits from this committee.

About three acres of ground were purchased nearly ten years ago in the residential section of the southwestern part of the city and a pumping station installed. This is an electrical pumping station, consequently there is no smoke or dirt surrounding it. Sixty-four acres of land were donated six years ago (lying southwest of this station) and are now beautified and have become one of the largest parks in the city. The pumping station is a small building of tapestry brick and makes a pleasing entrance to the park.

CORNER OF LAKE IN SWINNEY PARK.

Swinney Park was given to the city many years ago to hold in trust and to be used for park purposes. There was a flowing well on the property and last year the city decided to use this well as an additional water supply. This year the Water Works Department has built a neat pumping house over the well and installed an electrically driven pump. There has always been a small lake in this park, formed by the overflow from the well, and the Park Department enlarged this and sodded the banks, etc. This lake is used as a skating pond in winter and as it is of about the same depth as the reservoir lake it also makes a safe place for children to skate.

Lakeside Park also has a lake and lagoons which are swept of snow and flooded in the winter if necessary.

The expense of cleaning the snow from these lakes for the last three years has been as follows:

1915	$12.00
1916	54.37
1917	218.95

Last winter was long and severe, with frequent snow storms, which accounts for the increased cost of cleaning.

GULDLIN PLAYGROUNDS, GIRLS' SECTION.

ROADS FOR MILITARY SERVICE.

In a report on improvements for New Jersey's highways, General Goethals recommended to the State Highway Commission that it concentrate all its available funds on roads that would be of service for military purposes, naming fourteen routes that answered this description. In deciding upon what roads should be selected the following points should be considered:

1. Service to army camps.
2. Service to war plants and to open up sources of raw material, such as lumber.
3. Service between cities where the local road is on a route that might be more freely used.
4. Alternative routes to relieve overburdened thoroughfares.
5. Reduction of grades that now compel lightening of loads.
6. Relief to congested railroads.
7. The suitability of the roadbed for heavy motor truck traffic.

How to make a road suitable for heavy motor truck traffic is vital at the present moment. Many miles of New Jersey highways have been built of plain macadam, and although they were not designed to carry modern truck travel, much has been accomplished in carrying them through by applying a bituminous surface treatment; also, more permanent work has been done by using the old macadam as a base for bituminous macadam or concrete. The most approved methods of applying surface treatment, macadam and concrete with tar as a binder were described in our issues of May 25 and June 1.

THE DIFFUSION OF SEWAGE*

Principles Involved—Experiments and Experiences with Different Types of Outlets—Rapid Mingling with Fresh, Unpolluted Water Desirable.

BY KENNETH ALLEN.†

It is an erroneous idea that sewage discharged into a body of water of any given volume will be so diluted as to be inoffensive. To secure this result it is necessary that the dilution shall be in water containing a supply of dissolved oxygen and shall take place in such a manner that this oxygen may be utilized in purifying the sewage before putrefactive decomposition has an opportunity to begin. In other words, the dilution must be reasonably prompt and in water that is not already grossly polluted.

According to the standard dictionary diffusion is the "spontaneous intermingling of the molecules of two fluids, distinguished from mixture by mechanical force or by the action of gravity."

Dilution results in part from currents, eddies and mechanical agitation and in part from diffusion. Therefore diffusion should be as thorough as possible and may be brought about by bringing the two liquids into prompt and immediate contact.

A large volume of sewage discharged into quiescent water will retain its identity for a long time, especially if the two liquids differ greatly in character (salinity, turbidity, etc.). To secure intimate contact with the surrounding water the effluent may be given a special form and a high velocity, it may be subdivided into several units, and it may be delivered at such a depth that a considerable degree of mixing takes place in rising to the surface.

From experiments made by the Metropolitan Sewage Commission of New York in the laboratory and in the open harbor several interesting conclusions were drawn. In still water, sewage will first rise toward the surface or fall toward the bottom, depending upon the relative specific gravity of the two liquids. In sea water it will rise, while in fresh water it will remain for a longer period about the level of discharge. Diffusion begins at once and is more rapid the less the salinity of the water. It probably bears some relation to the form of the jet, but at this stage it is of less importance than the mixing action due to currents. Where turbulent eddies occur, mixing is rapid and the buoyant tendency due to the difference in specific gravity is obliterated. After this initial mixng, further tendency toward putrefaction is usually deferred for at least several hours.

It was observed that when discharged into an equal mixture of sea and fresh water, sewage rises from depths not exceeding 30 feet, so that it will probably be visible at the surface; but from depths of over 40 feet it will probably not be seen unless discharged in very large volumes, although much depends upon the existence of sub-surface currents.

A high salinity of the water retards diffusion. Streams of sewage are diffused more slowly in tidal waters than in rivers of fresh water. Moreover, salinity increases the upward tendency in submerged effluents so that they reach the surface more promptly and hence with less opportunity for diffusion. For these reasons and because the saponification of the soaps in sewage renders it more nearly opaque, because its capacity for dissolved oxygen is less and because any decomposition of sludge deposits gives rise to more offensive odors in salt water than fresh, the latter is generally a more favorable medium into which to discharge sewage.

The effluent from a submerged outlet in salt or brackish water rises to the surface in the form of a cone and spreads rapidly in a thin sheet so that at a moderate distance there is usually little evidence of pollution below a foot or two from the surface, although the line of demarcation of the sewage field may be quite definite for a considerable distance.

Parry and Adeney mention that sewage rose at once to the surface from an outlet submerged from ten to fourteen feet and was by that time diluted with about five volumes of sea water. It then flowed off in a narrow stream with little further dilution for some time. Bottom currents were not much polluted. After dilution, further purification proceeded slowly, being but nineteen times that at the outfall at a distance of eight hundred yards.

"At present, about 25 per cent. of the combined sewage of Amsterdam is emptied into the Zuyder Zee. The natural purification is distinctly visible there; the polluted water being less heavy than sea water, floats on the top like a gigantic grease spot. Only in the center of the spot, near the mouth of the delivery pipe, on a relatively small area, is the odor of the sewage apparent, but further on, sun and wind have already exercised their purifying influence, so that this is no longer noticeable."*

L. E. Cooley, in testimony regarding the Chicago Drainage Canal, stated: "I watched the effluents * * * from the Twenty-second street sewer and from the Thirty-fifth street sewer and have been able to see the same in the lake half a mile or more from the shore * * * and I have seen the effluent (of the Fullerton avenue conduit) going in an unbroken body out into the lake for more than a mile before it was diffused."

It has been observed at Boston that the front of the sewage field travels at a faster rate than the current. As it is carried along it diffuses from below and becomes thinner and thinner until but a microscopically thin film of grease is left called "sleek." This is very persistent and carries the visible evidence of its origin far beyond that of the dilute sewage below. It is, however, quite unobjectionable otherwise.

With a septic sewage, high temperature, and a stream low in dissolved oxygen, conditions favor putrefaction, and particular pains should be taken to secure rapid diffusion. The desirability of this is becoming recognized in the construction of submerged sewer outlets.

At Moon Island, fifty million gallons of crude sewage from Boston is discharged near the surface on the first two hours of ebb tide. The sewage is dark, septic, foul in appearance and with a strongly offensive odor, although gross pollution is confined to the upper five feet in depth of water. Discoloration of the water at times covers one thousand acres, half of which may be called "offensive," and extends for a distance of over one and one-half miles from the outlet.

A marked improvement is observed in the continuous discharge of sixty million gallons per day off Deer Island from the North Metropolitan system. The discoloration is hardly noticeable below two feet from the surface and little evidence of sewage is ordinarily found beyond a distance of nine hundred feet.

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*From "The Polytechnic." †Engineer of Sewage Disposal, Board of Estimate and Apportionment, New York City.

* A. W. Bos, Director Public Works. Proceedings, International Engineering Congress, 1915.

This marked improvement over the Moon Island outlet is attributable to the fresher condition of the sewage and its continuous discharge at correspondingly lower rates. But even here the sewage field may be detected as much as one and one-half miles from the outlet under certain conditions.

The more recent two outlets from the South Metropolitan system near Peddocks Island marked a further improvement in being placed at a depth of some thirty feet of water at low tide. Here fifty-three million gallons per day are discharged continuously but there is no marked discoloration more than thirty feet from the outlet.

The discharge of sixty-seven million gallons of the sewage of Washington from two outlets at a depth of about twenty-eight feet in the Potomac river is difficult to detect at the surface and the same may be said of that from the three outlets at Hamburg where fifty-three million gallons per day enter the Elbe. In these examples there are the additional advantages of a discharge into fresh water, and in dividing up the flow between two or more outlets.**

The Deer Island outlet in Boston harbor is being extended three hundred feet into water fifty-two feet deep at low tide. For about two hundred and forty feet this is of seven feet cast iron pipe converging to four feet at the extreme end. The last one hundred and twenty-six feet is composed of lengths having openings near the middle and in the top directed forward by which the discharge will take place at fourteen orifices including the end of the last pipe.

It has been proposed to construct outlets for the Passaic Valley sewer in New York Upper Bay, conical in shape, diverging upward and with a spiral flange on the inside for the purpose of delivering the sewage in the form of a thin hollow cone. This, it was expected, would provide a large surface of contact with the bay water immediately after discharge.

Another feature of the Passaic Valley outlet is in providing multiple outlets. This has frequently been proposed in order to secure rapid diffusion but has seldom been carried out. At Toronto the outfall was carried out about three thousand two hundred feet from shore to a depth of twenty-one feet. The last five hundred feet was tapered from a diameter of five feet to one of two feet and perforated with 4-inch orifices four feet four inches apart.*

Another example of multiple outlets is in the new outfall at Cleveland where seventy million gallons are discharged daily a half mile from shore at a depth of thirty feet from 6¾-inch holes, spaces seven and one-half feet apart on each side of the tapered outlet pipe and forty-five degrees above the horizontal diameter.†

There is an advantage in a high velocity of discharge, but as this involves loss of head it cannot often be availed of unless the sewage is pumped. A horizontal is preferable to a vertical direction for the jet as it offers a greater opportunity for diffusion during the ascent to the surface, after which this proceeds more slowly.

**See table

*As the flow, which is now about fifty-five million U. S. gallons per day, caused a backing up by the increased friction the outer four hundred feet of this outfall sewer have been removed.

†Another outlet of "Lock-Joint" concrete pipe is now under construction at Cleveland. This will be eighty-four inches in diameter for two thousand four hundred feet and then decreasing to forty-eight inches in another one thousand feet.

Also, at Lakewood, O., a similar outfall of one thousand one hundred feet of 36-inch pipe decreasing to thirty inches and twenty-four inches in the next four hundred feet has been laid to a depth of twenty feet of water. Diffusion is promoted by 44-inch holes near the top of the pipe spaced about seven feet apart.

EXAMPLES OF SUBMERGED OUTLETS.

City	Population	Million gals. daily	Treatment	Outlets No. Diam.	Outlets Dist. from Shore	Outlets Depth feet	Stream	Tide Range
Amsterdam	6,000†	—	None	1-59"	120 ft.	—	Zuyder Zee	1.1
Baltimore, Md.	580,000	45	Trickling filter	2-60"	900 ft.	7	Back River	1.0
Boston, Mass.								
Moon Island	377,000	100	Storage 4 hrs.	1	0 ft	0	Boston Harbor	9.6
Deer Island	543,000	60	None	1-75½"	1,800 ft.	0	" "	9.6
Peddocks Island	300,500	53	None	2-60"	1 mile	27 & 30	" "	9.6
Bremen	247,500 (1910)	17	Fine screening	2-47" 1-44"	—	16	R. Weser	12.5
Bronx Valley, N. Y.	30,000 (1910)	3	None	2-48"	495 ft.	45	Hudson R.	4.0
Buenos Ayres	1,700,000	—	None	2-42"	1,500 ft.	—	R. Plate	3.0
Copenhagen	587,000‡	20	None	1-43"	4,640 ft.	33	The Sound	0.5
Cleveland, O	640,000	70	Part fine screening	1-60"	—	30	L. Erie	—
Cologne	540,000	19	Fine screening	1-47"	480 ft.	13.8	R. Rhine	—
Dresden	560,000	27	Fine screening	1-47"	—	6.5	R. Elbe	—
Hamburg	953,000 (1912)	53	Medium screening	3 79"	230 328 ft. 426	30	R. Elbe	6.2
Havana	360,000 (1911)	10.5	None	1-60"	550 ft.	30	Gulf of Mexico	1.0
Ithaca, N. Y	17,000 * *	—	None	1	100 ft.	6	L. Cayuga	—
London								
Barkive	540,000 (1910)	215	Chem. Prec.	1	0 ft.	0	R. Thames	14.7
Cressness		172	Chem. Prec.	1	300 ft.	25	R. Thames	14.7
Long Beach, Cal.	35,000	3	Fine screening	1-36"	1,100 ft.	15	Pacific O.	4.1
Lynn, Mass.	90,000	12	None	1-60"	3,500 ft.	30	Lynn Harbor	9.2
(Proposed)			None	1-60"	3,300 ft.	30	Buzzards Bay	4.1
New Bedford, Mass	115,000	14						
New London, Conn.	20,000 (1910)	—	None	1-24"	900 ft.	16.5	New London Harbor	2.5
Passaic Valley, N. Y. (Proposed)	——	—	Sedimentation	—	—	40 to 50	N. Y. Upper Bay	4.5
Rochester, N. Y.	248,500	24	Sedimentation	1-66"	7,000 ft.	40	L. Ontario	—
Salem, Mass.	44,000	7 6	None	1-30"	5,700 ft.	12	Salem Harbor	9.0
Toronto, Ont.	376,200	55	Sedimentation	1-60"	3,200 ft.	21	L. Ontario	—
Washington, D. C.	355,000	67	Skimming	2 60"	750 ft. 800	28	Potomac R.	2.9

* In tidal waters, below mean low tide
In non-tidal waters, below mean level.

† Above 300,000 to sewers.

‡502,000 to outfall sewer.

Estimated 120 gal. per cap.

**87,000

At Copenhagen, to secure a similar result, there are provided two openings six inches wide by four feet long near the outer end of the new 43-inch wood stave outlet pipe, by which the upward discharge of thirty-three million gallons per day will take place in the form of a thin sheet.

The area of pollution increases at a higher rate than the volume of discharge, so that the interception of large volumes of sewage to a single outlet is unwise if the conditions are unfavorable for sufficient diffusion and dilution.

With so many factors involved it is impossible to formulate precise rules for the location and design of sewer outlets to secure prompt diffusion, but the principles to be followed, as has been shown, are well known and may be summarized as follows:

1. Locate the outlet in water.
   a. as nearly fresh as possible.
   b. as nearly saturated with oxygen as possible.
   c. with the swiftest possible current.
   d. at as great a depth as possible.
2. Discharge the sewage so as to secure as intimate a contact with the water on discharge as possible. This may be promoted by special orifices and by multiple outlets.

WATER WORKS OPERATION.

Deposits and Growths in Mains—Removal by Flushing and by Special Appliances—Detecting Presence of Obstructions.

STREET MAINS.

The mains of a water works system should deliver through the outlets provided, all the water received by them and should do so with the least possible loss of head. They also should deliver the water in as good condition as when it entered them. To serve these purposes most effectively, the mains should be free from leaks, the interiors should remain smooth and of full bore and no deposits or growths should occur in them that will tend to impart to the water any color, odor or suspended matter, whether continuously or periodically under conditions of maximum discharge.

Some waters carry suspended matter that settles in the mains when or where velocities are low, to be stirred up and carried with the discharge through service connections when any unusual conditions cause an increase in velocity of flow. The only complete remedy for this is to remove from the water, before it enters the mains, all suspended matter, or matter in solution which may later take on an insoluble form. Where this is not practicable, the next best preventive is to offer as few opportunities as possible for such matter to settle out, thus distributing the suspended matter in minute quantities through the entire discharge rather than permitting it to accumulate in the mains and be discharged in concentrated amounts periodically. Dead-ends are the points where deposits most commonly occur, since in these there is no flow except that occasioned by the service connections or fire hydrants on the dead-ends themselves and these may be so few as to produce ordinarily a very low velocity, with no flow whatever during a considerable part of the time. This is one argument for the elimination of dead-ends by cross connections and gridironing as completely as the street layout permits.

Where deposits occur from this cause, the only practicable remedy appears to be the periodical flushing out of the mains by opening fire hydrants at such points as will produce high velocities at the affected sections, thus picking up the suspended matter and discharging it into the street. The frequency with which this flushing should be performed at any given hydrant can generally be learned only by actual experience, although when a water forms deposits it may generally be expected that they will occur most abundantly in dead-ends and along stretches of mains whose capacity is greater than is demanded by the present consumption supplied through them.

To make this flushing most effective on sections other than dead-ends, it is frequently desirable to close such gates as may be necessary to cause the discharge to reach the hydrant from one direction only, thus producing approximately double the velocity that would be caused if water approached the hydrant from two directions. This will generally result in a much more thorough cleaning of the mains with a given amount of water or an equally thorough cleaning with a less amount, even though the main be flushed on both sides of the hydrant, one side being flushed while the other is cut off, and the other then being flushed while the first is cut off. If flushed in this way, it is desirable, after flushing from each direction separately, to open all valves and flush from both directions at once, since the water approaching the hydrant from the second direction may carry some sediment beyond the hydrant connection and render slightly turbid the water for a few feet beyond, which turbid water, however, would be discharged in a few seconds when the water approaches the hydrant from both directions at once.

Some waters are of such nature that they cause considerable vegetable growth, frequently called "pipe moss," to attach to the inside of a water main. This itself may be advantageous rather than otherwise in that it improves the character of the water, but under certain conditions the vegetable matter may become detached and pass out through the services or may die and give an odor and taste to the water. Ordinarily the gradual natural death of the vegetable matter is taken care of by minute animals that live in the "pipe moss," they in turn serving as fertilizer for the organic matter. As long as conditions remain continuously uniform, these vegetable and animal growths are likely to give little trouble and their existence to be unsuspected and unobjectionable. Occasionally, however, the character of the water may change, as by the sudden influx of a larger volume than usual from one of two or more sources of different natures; by the addition to the water of chemicals used in precipitation or sterilizing water; or sometimes from a sudden reversal of direction of flow in a pipe in which the flow ordinarily is continuously in one direction. The effect of purification chemicals on organic growths in mains has not, we believe, had much, if any, serious consideration. When such chemicals are applied continuously, any affect would probably last for only a few days; if added only occasionally (as when confined to those periods when it is feared that spring freshets will cause an inwash of a large amount of pollution), it is conceivable that either animal or vegetable matter in the pipes may be killed and cause an objectionable condition of the water.

Most serious, however, is the formation in the pipes of obstructions that cannot be removed by flushing. Such obstructions may be caused by deposits of lime or other mineral matters carried by the water, but is commonly due to the formation of tubercles on the walls of the pipe. These tubercles seldom affect the quality of the water, but they decrease the amount that is delivered by the pipe and reduce the pressure by both decreasing the open area and roughening the interior surface. It is

CLEANING MAINS, LEAKAGE AND METERS (Continued).

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
North Dakota:						
Devil's Lake	No	....	Surface inspection	No	1	Company
Grand Forks	Yes	Flushing	Sound	No	90	Consumer
Wahpeton	No	....	....	No	3	City
Ohio:						
Bryan	No	....	Inspection	No	95	City
Celina	No	....	None	No	10	City
Cincinnati	Yes	By machs., contract	Inspection	No	75	Consumer
Cleveland	....	Flushing	Pitometer & hose & meter	No	97	City[g]
Conneaut	Yes	Flushing	Aquaphone	No	58	Consumer
Coshocton	No	Flushing	Inspection	No	5	Consumer
Dayton	No	....	Pitometer survey	No	100	Consumer
Defiance	Yes	Flushing	Aquaphone	Think not	10	Consumer
East Cleveland	....	....	....	No	100	Consumer
Eaton	....	....	Darley detector	No	60	City
Franklin	No	....	None	No	....	Consumer
Girard	No	....	....	No	70	Both
Gibsonburg	No	....	Meters	....	99	City
Kent	No	....	Meters	No	100	Company
Lima	Yes	Flushing	None	No	90	Both
Marietta	Yes	Never cleaned	None	No	25	City
Milan	No	....	Surface inspection	No	90	City
Mt. Gilead	No	....	Attention	No	90	Consumer
Mt. Vernon	No	....	....	No	40	City
Painesville	Yes	Flushing	Aquaphone	No	100	City
St. Marys	No	....	None	No	50	City
Tiffin	No	....	Meters	No	100	Company
Toledo	No	....	Attention	No	97	Consumer
Troy	Yes	Flushing	Inspection	No	....	City
Urbana	No	....	None	Think not	15	Consumer
Wadsworth	No	....	None	No	None	....
Wapakoneta	No	....	Meters	No	100	Consumer
Wauseon	No	....	Sonoscope	Think so	80	Consumer
Xenia	....	....	None	No	25	Company
Oklahoma:						
Guthrie	No	....	Observation	Yes	90	City
Pawhuska	No	....	Surface inspection	No	None	....
Stillwater	No	....	....	....	100	Consumer
Woodward	No	....	None	No	70	Consumer
Oregon:						
Baker	No	Never cleaned	None	Think not	100	City
Eugene	....	Not cleaned	....	No	95	City
Hood River	Very little	Flushing	Inspection	No	Small	City
La Grande	Yes	Flushing	None	No	95	City
Marshfield	No	....	Detectophone	....	5	Company
Pennsylvania:						
Ambler	....	Flushing	Inspection	....	50	Company
Barnesboro	Yes	Flushing	Aquaphone & leak finder	No	3	City
Carbondale	No	....	Inspection	No	t	Company
Catasauqua	No	....	None	Think not	Small	City
Chambersburg	No	....	House inspection	No	48.4	Consumer
Clearfield	No	....	None	No	5	Company
Duquesne	No	Flushing	Venturi meters	Think not	100	City
East Stroudsburg	Yes	Flushing	....	No	5	City
Elizabethtown	No	....	Leak detector	No	87	Company
Ford City	Yes	Flushing	None	No	100	City
Hanover	Yes	Cleaning machine	....	....	5	Company
Juniata	No	Flushing	None	No	Few	City
Lancaster	No	....	Inspection and meters	No	50	Consumer
Lansford	Yes	Go-devil	None	No	20	Company
McDonald	No	....	....	No	99	Company
Meadville	No	....	By meter reader	No	100	Consumer
Media	No	....	None	No	3	Both
Minersville	Yes	Cleaning machine	Sound and gauge	No	1	Company
New Castle	....	By contract	Testing by sections	No	95	Both
Oil City	No	....	None	No	100	Consumer
Pottsville	....	Not cleaned	Inspection	....	4	Company
Sewickley	Yes	Not done	None	Don't know	4	City
Slatington	No	....	Inspection	At times	5	City
So. Brownsville	No	Not cleaned	Inspection	Yes	33	Consumer
Susquehanna	Yes	Flushing	Watchfulness	No	5	Company
Uniontown	Yes	By contract	Meters	No	80	Company
Rhode Island:						
Providence	No	....	Meters	No	93	Consumer
Woonsocket	....	....	Meters and master meter	No	85	City

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* The word "city" is used to designate municipalities of any nature or water districts; g—consumers own a few; t—domestic services not metered; hotels, factories, livery stables and garages metered.

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not uncommon to find a small pipe with its maximum capacity reduced 50 per cent by tuberculation, and even considerably greater losses of head and discharging capacity have been found in 4-inch and 6-inch pipes. In most cases the carrying capacity of pipes so affected remains sufficient for ordinary domestic consumption, but in case of fire or other unusual demands, the loss of volume and pressure becomes a serious matter.

For removing tubercles, there appears to be no practicable method except that of cutting or scraping them off by passing some special appliance through the pipe. Several such appliances have been used, one of the oldest being the "go devil" that was originally used for cleaning the long mains through which oil is distributed in the oil well districts. This appliance is introduced into the main at a special opening, which can then be closed and the pressure turned on, while a hydrant or blow-off is opened some distance away. The "go-devil" is carried along by the flowing water and the cutters with which it is provided remove the interior accumulations. The appliance makes sufficient noise to enable it to be located by anyone listening on the surface of the street, and by keeping continuously over it as it travels, its position can be known if it is stopped by an obstruction which it cannot remove; in which case an excavation can be made in the pipe at this point and a break made in it to remove the obstruction by hand. A more common form of pipe cleaning appliance is one that is attached to a rope and is drawn through the pipe, just enough water being allowed to flow past it to wash out the material that is removed from the walls of the pipe.

Some cities are never troubled with tubercles; in

METERS. RATES. MUNICIPAL USE (Continued)

City and state	Is deposit on meter required?	Is rental charged for meters? †	Does city obtain water without payment?	Use made of free water	Used for Municipal Purposes	
					Percentage	Is any of it metered?
North Carolina:						
Charlotte	Yes	No	Yes	Streets, sewers, public bldgs.	15	Bldgs. and fountains
High Point	....	....	....	....	0.8	No
Lenoir	....	....	....	....	5	Schools
New Bern	No	No	No	....	2	All but flush tanks
Raleigh	No	No	No	....	......	No
Rocky Mount	$5	No	No	....	8	No
Statesville	....	....	....	....	10	No
North Dakota:						
Devil's Lake	Yes	No	No	....	......	No
Grand Forks	....	No	Yes	Sprinkling, flushing, fire	10	No
Wahpeton	....	No	Yes	Flushing, fountains, parks, fire	......	No
Ohio:						
Bryan	No	No	No	....	10	No
Celina	No	No	Yes	Flushing streets, city buildings, fountains	8	No
Cincinnati	....	....	Yes	All municipal uses	5	No
Cleveland	Yes	Minimum charge	Yes	Schools, fountains, flushing streets and sewers	9.4	6.5%
Conneaut	....	....	Yes	City buildings, schools, etc.	5	No
Coshocton	No	No	Yes	Fountains and fire	8	No
Dayton	....	....	Yes	All public purposes	19	No
Defiance	No	No	Yes	Public buildings, schools, flushing sewers	......	No
East Cleveland	....	....	Yes	Fire	20	Schools
Eaton	Yes	No	Yes	City buildings and fire	50	No
Franklin	....	No	Yes	All city uses	......	No
Girard	No	....	Yes	All city purposes	......	No
Gibsonburg	$10.00	....	Yes	Sprinkling, flushing, city hall	5	No
Kent	No	No	No	....	2	All
Lima	No	Yes	Yes	Schools, parks, fountains, flushing streets and sewers	10	No
Marietta	Yes	No	Yes	Parks, streets, sewers, cemeteries	......	No
Milan	Yes	Yes	Yes	....	1	No
Mt. Gilead	No	No	Yes	Flushing sewers	10	No
Mt. Vernon	No	Minimum charge	Yes	All city uses	......	No
Painesville	$2.50	No	Yes	Fire	5	No
St. Marys	....	....	No	....	25	....
Tiffin	Yes	No	Yes	Flushing sewers, fountains, public buildings	......	Schools
Toledo	....	....	Yes	Flushing streets and sewers, parks, cemeteries, engine houses, fire	4.23	Schools and flush tanks
Troy	No	No	Yes	Fountains and horse troughs	15	No
Urbana	No	No	Yes	Streets, sewers, fountains, water troughs	......	....
Wadsworth	....	....	Yes	City buildings and fire	10	No
Wapakoneta	Yes	No	Yes	Public buildings	......	No
Wauseon	No	No	No	....	15	No
Xenia	....	No	Yes	Public buildings	......	No
Oklahoma:						
Guthrie	No	No	Yes	Street sprinkling, City Hall. fire	15	No
Stillwater	....	....	....	....	10	No
Woodward	....	....	Yes	Flushing sewers, sprinkling streets, fire	15	No
Oregon:						
Baker	No	$1.50[s]	Yes	Sewers, street sprinkling, city buildings	33	No
Eugene	No	No	No	....	30	Schools, sewers, fountains
Hood River	No	No	No	....	......	No
La Grande	No	25c to 75c	Yes	....	10	No
Marshfield	Yes	No	No	....	2	Yes
Pennsylvania:						
Ambler	....	....	No	....	......	Schools
Barnesboro	No	No	No	....	10	No
Carbondale	No	No	No	....	10	Fountains
Catasauqua	....	Yes	Yes	Fire	2	No
Chambersburg	....	....	....	....	20	Fountains
Clearfield	No	Ready-to-serve charge	Yes	Flushing streets and sewers, city buildings, fountains	......	Schools
Duquesne	No	Minimum charge	Yes	Parks and libraries	......	Schools
East Stroudsburg	....	....	....	....	10	No
Elizabethtown	No	No	Yes	Flushing sewers	1	No
Ford City	No	No	Yes	City hall and street cleaning	......	No
Hanover	No	No	Yes	Street flushing, engine houses, library, fountains	......	Yes
Juniata	No	No	....	....	......	No
Lancaster	....	....	....	Fountains, fire houses	......	....
Lansford	No	No	No	....	......	Yes
McDonald	No	No	Yes	Flushing streets	......	Will be
Meadville	....	....	Yes	Flushing and fire	......	All buildings
Media	No	No	Yes	School and municipal bldg.	......	No
Minersville	No	No	Yes	Sewers and fire	......	No
New Castle	No	No	No	....	......	Schools, fountains and city buildings
Oil City	No	No	Yes	All city purposes	......	Schools and city buildings
Pottsville	No	No	Yes	Fire	......	Schools
Sewickley	No	No	Yes	All city purposes	......	No
Slatington	No	No	Yes	Schools, churches and fire houses	......	No
So. Brownsville	....	....	Yes	Washing streets	......	No
Susquehanna	....	....	Yes	Water trough	5	No
Uniontown	No	No	Yes	Fountain	......	City buildings
Rhode Island:						
Providence	....	....	No	....	......	All but fountains
Woonsocket	Yes	No	No	....	......	All

† Amounts given are annual rentals, in some cases reported as quarterly or monthly payments; s—for ⅝-inch meter.

others the character of the water appears to be such that tubercles cannot be prevented and the mains must be cleaned at intervals if they are to be kept at approximately full capacity. Several cities where the latter conditions exist have provided regular hatch boxes with plates bolted on which can be used for the introduction and operating of the cleaning appliances, thus avoiding the necessity of breaking out a section of pipe at intervals of a few hundred feet along mains whenever they are cleaned.

During the cleaning, the main being cleaned is of course out of service, and it is therefore desirable to perform the entire operation as rapidly as possible. Since the cleaning is done at such infrequent intervals, experience in the work can hardly be attained by the superintendent or foreman of the plant, and the cleaning is quite frequently performed by a company that makes water main cleaning its business.

Inspection to determine whether there are deposits in a main that can be flushed out consists in opening fire hydrants at points where such deposits would most commonly occur and nothing whether, after flowing for two or three minutes, the water shows sediment by its color. Tests to determine the presence of tuberculation is more difficult. Wherever there is a break in a main, or where a tap is made by the ordinary hand method so that the condition of the interior of the pipe can be determined by passing the finger through the service opening and feeling the inside of the pipe, opportunity should be taken to determine the condition of the interior of the mains. Such openings, however, are not likely to be frequent, and are too widely scattered throughout the system to be used as the sole source of information. Since the chief noticeable result of tuberculation is the reducing of volume and pressure, this may be used as a means of determining its presence. If there is an abundance of valves well located throughout the distribution system, it will generally be possible to manipulate these so that water drawn from a given hydrant can come through one line of pipe only. By placing a pressure gage on this hydrant and noting the pressure with the hydrant closed; then attaching a length of fire hose to the hydrant, opening it, and noting the drop in pressure and measuring the approximate discharge through the hose, and knowing the diameter of the pipe feeding the hydrant and its length measured from the nearest large main or point from which water reaches it from two or three directions, it is possible to calculate the friction factor, and, comparing this with such factor for new pipe as given by any of the ordinary textbooks, to learn whether there is a much greater friction loss than there should be. This is only a rough approximation, since there will be some loss in the mains that feed the short stretch under test, but if these are larger or are numerous, such loss will probably be considerably less than one-fourth of the total loss noted, unless such feeder mains are themselves in much worse condition than the one under test.

A more accurate determination can be made if there is another fire hydrant along the stretch of main under investigation, on which also a pressure gage can be placed. With these two gages in use, their comparative readings before and during the discharge through the either of the fire hydrants can be used to determine the loss of head in the length of main between the hydrant connections.

In the case of a system which has been inspected regularly and systematically from the time of its construction, it will generally be sufficient merely to attach a line of hose with gage to a fire hydrant and note the readings of the gage with the hydrant shut and open respectively. If these readings are taken when the mains were new and a record kept of them, comparison of the readings at any future time will permit an approximate determination of the existence of obstructions in the interior of the main. In this case the gage reading with the hydrant closed should be compared with the similar reading when the system was new, to note to what extent the increase of regular continuous consumption through the main in question has cut down the pressure; then in comparing the pressure when the hydrant is open with that when when the system was new, allowance should be made for this loss of head due to increased consumption of water. In making such a test, the conditions aside from the main itself should be uniform during successive tests, and for this purpose the same standard quality and length of hose and standard nozzle should be used by the city in all subsequent tests as was used in the original one when the mains were new.

FUEL AND ROAD CONSTRUCTION.

The large amounts of fuel required to manufacture the materials used in brick and concrete roadways was given as an argument in favor of macadam and bituminous macadam roads by H. H. Sharp, of the France Stone Company and formerly chief state highway engineer of Ohio, in a paper before the Northwestern Ohio Society of Civil Engineers. His statements were as follows:

"A minimum of one ton of coal is consumed in the burning of each one thousand brick; approximately two hundred and fifty pounds of coal is consumed in the manufacture of each barrel of cement. Approximately 25 pounds of coal is consumed in the production of one ton of crushed stone or slag, and this coal is used to operate steam shovels, locomotives and the other necessary plant equipment, or the equivalent in electric current is used. In figuring one ton of coal consumed for each thousand brick, and 250 pounds to each barrel of cement manufactured, no coal is figured in or allowed for steam shovel operations to excavate shale or fire clay from which brick is produced, run locomotives or mills; likewise no coal is considered in these figures to produce rock, marl or other material used in the manufacturing of cement. Therefore, in this comparison, the coal consumed in the production of stone or slag should be ignored since it is offset entirely by that consumed in the other operations outside of those taken for this comparison. Each mile of brick road 16 feet wide requires approximately 375,000 brick, representing a coal consumption of 375 tons. If this brick road is laid on a five-inch concrete base, 2,000 barrels of cement is required, representing a coal consumption in the manufacture thereof of 250 tons. The total consumption of coal in the building of each mile of 16-foot brick road on a five-inch concrete base is therefore 625 tons.

"In 1917 there was built in Ohio approximately 150 miles of brick road on concrete foundation, outside of municipalities, which, on the above basis, would require approximately 94,000 tons of coal in the manufacture of the brick and cement used in these roads. Each mile of 16-foot concrete road requires approximately 3,325 barrels of cement, representing a coal consumption of 415 tons. In 1917 there was built in Ohio approximately 125 miles of concrete road outside of municipalities, which would require approximately 52,000 tons of coal in the manufacture of the cement used for these roads. These figures, while staggering in the amount of fuel consumed in the building of such highways, will be found to be conservative, and whatever error exists is on the side of lesser rather than greater consumption of coal."

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SEWAGE DISCHARGE INTO SALT WATER.

Many think of salt water as an ideal receptacle for the discharge of sewerage systems, both because of the infinite volume of the ocean and because it is never used for human consumption. An article in this issue, however, calls attention to disadvantages of discharging sewage into salt water. The chief ones are the low rates of diffusion, low capacity for dissolved oxygen and greater offensiveness of putrefaction; added to which is the fact that the large volume available for dilution is often more apparent than real.

The last named is often not realized until conditions approach a crisis. Where a city is on a straight line of coast, there is a more or less continuous movement of the water in one direction resulting in a constant renewal of the water. But few cities and probably no large ones are so situated, since large cities require harbors, and these are not found on straight coast lines. In a harbor the only renewal of water is that caused by the streams flowing into and through it, and the small amounts of unpolluted sea water entering with each flood tide. If the harbor is at all deep, the amount of the latter that reaches the sewer outlets is small, and the purifying effects due to dilution are little greater than those afforded by the entering stream.

The limitations of a harbor outlet often are not realized for some years, for several reasons. One is that no vigorous complaints of pollution of the water are occasioned until such pollution reaches the point of creating a nuisance, and when this occurs the limit of digesting capacity of the water has already been exceeded and conditions will rapidly grow worse. Another is that seaport cities grow rapidly and the amount of sewage increases in equal or greater ratio. A third is that deposits gradually accumulate on the bottom of the harbor, at first decreasing the oxidizing work demanded of the water, but later increasing such demand as the deposits putrefy. Disposal of sewage in harbors will probably and necessarily be continued, but its limitations in each case should be realized and plans made accordingly.

WATER WORKS LAND FOR PARK PURPOSES.

A large part of the money spent by cities for parks is generally for the purchase of land. Does the city not sometimes overlook the possibility of using for park purposes land it already owns? Or could not many cities that feel that they cannot afford parks, develop for this purpose at slight expense land that is already in their possession? We have especially in mind the use of land owned by municipal water works on which are located reservoirs, pumping stations, wells, etc.

We recall noticing in one city a plot of about 25 acres located only a few blocks from the center of the city, in which were sunk the wells for the city supply, which land had not even been graded and cleared of weeds, to say nothing of being parked and made attractive as a breathing place for the citizens, as could easily have been done. In contrast with this, another water works department has so used every piece of its land as to give the public the greatest possible use of its property, some being used as a picnic grounds, others provided with flower gardens, shaded walks and seats, while a reservoir within the city is covered by a concrete roof which is given a sidewalk finish and used for roller skating in summer and ice skating in winter.

There are, we believe, great numbers of water works properties throughout the country that could be used as public parks without in any way interfering with their serving to the fullest extent the functions for which they were orginally purchased. How one city has utilized such properties is described in this issue and we expect to give descriptions of other similar illustrations in following issues.

There are of course conditions under which the use of water works property by the public is not to be recommended, this being especially the case when such use would in any way endanger the purity of the water supply. The admission of the public to water sheds is generally accompanied with danger of such pollution, as was described in the article a few weeks ago relative to the water shed of the supply of Colorado Springs. Bathing in reservoirs of course should be permitted under no considerations, nor should fishing or boating upon them be permitted, except under the most rigid oversight. (One city permits fishing in its reservoir by special permit, a caretaker being required in each boat, the cost of his services being included in the cost of permit.) Where the reservoir does not receive drainage from the surrounding land, however, there would seem to be no good reason for not permitting the use of this land for park purposes, providing a fence surrounds the reservoir at a sufficient distance to prevent papers, fruit skins, and other objectionable articles being thrown into it. In the case of a small reservoir, the fence could be close to the reservoir and the presence of one watchman would be sufficient to prevent any polluting of the water. The grounds around the reservoir could be sodded, provided with shade trees, flower gardens and paths, with resting places and other features of a city park. Where there are no open reservoirs, there would seem to be no danger whatever to be avoided, this being the case in the grounds surrounding pumping stations or those in which are constructed purification plants or covered reservoirs.

Aside from the desirability of giving the citizens the use of this public property for pleasure purposes, the greater attractiveness of property so developed as compared with weed-grown and neglected properties, such as that above referred to, is an important point which is receiving more general recognition than was formerly the case. Many cities now appreciate that neatly kept buildings and grounds connected with any public utility help greatly to give the public a confidence and a feeling of personal pride and interest in the utility, and help to invite them to a more intimate acquaintance with and fuller appreciation of the plants which are operated for their benefit; all of which tend to diminish complaints concerning the service and secure a more cordial relation between the citizens and the officials in charge of such utilities. Moreover, neatness and regard for appearance on the outside of the plant is certain to give the employees engaged in it more respect for the plant itself and a greater appreciation of the importance of cleanliness and accuracy in performing their duties (which is of special importance in securing and preserving purity of supply), and of the necessity of keeping in the best of condition, as to serviceability and appearance, the machinery or other appliances in their charge.

Even though no funds may be provided for elaborate park work on the grounds surrounding a pumping station or reservoir, the commissioners and superintendents in charge should feel enough interest and pride in the property to see that at the very least the grounds are sodded, a few trees, shrubs, and flowers placed at effective points, so that neither officials nor citizens need be ashamed of the property in which they all have an interest.

A REVISION OF WATER RATES.

Placing Rates on a Scientific Basis and Increasing Revenue at Catskill, N. Y.—Classification of Overhead and Operating Costs.

BY HENRY W. TAYLOR.

Due to present cost of material and labor and the price of coal, many municipalities have found it necessary to consider revision of water rates, in order to meet present operating and overhead expenses. Such a revision of water rates has been made for the village of Catskill, New York, and this case contains many factors which are typical of municipalities throughout the country .

The operating costs for the year 1917 exceeded the collected revenue and the necessity of increasing the rates became imperative. It was also considered, inasmuch as this rate revision must be made, that the whole basis of rates might better be changed so as to conform to definite business principles.

The present rates are as follows:

Private dwellings, for one plain faucet, including hot and cold water, each family	$4.00
(No extra charge for sanitary tubs)	
Boarding houses, having a number exceeding 8 persons, inclusive of family, for each person	.50
Bath tub (private), each	2.00
Bakeries	$6.00 to 12.00
Offices, per year	2.00 to 4.00
Private stables for one horse or cow	2.00
Restaurants, per year	$6.00 to 10.00
Shops and stores not above classified and requiring but a small quantity of water, per year	$2.00 to 4.00
For sprinkling lawns in front of premises to street line and to line of adjoining property with hose held in hand, for each 1,200 square feet or less, per year	2.00
For each additional 100 square feet	.50
[illegible] per year	2.00
[illegible] allowed to flow continuously, per year	5.00
[illegible]lly, per year	3.00
[illegible] al closet	1.50

[illegible] classes of [illegible]

Complete data were obtained as to the cost of pumping and past records of the board gave the required information as to miscellaneous expenses of operating the system. Any further information required related chiefly to the services, their number, character, classification, etc.

No house to house inspection of services had been made for some years, on a systematic basis, and the need for such an inspection was at once patent. An examination of the books also indicated the advisability of installing additional meters for certain classes of services, and it is thought that some fifteen additional meters will have a considerable effect either upon the amount of water used or upon the amount of water paid for.

The total overhead and operating charges against the system formed the basis of the new rate. In studying these, the fixed charges were treated separately, including the idea of a service rate properly distributed to cover the fixed charges. The fixed charges have little to do with the amount of water used and should be met by a service charge which represents the share of the fixed charges which each class of consumer should rightfully pay. Without going into further discussion of this general proposition, the application of the idea in the case of Catskill may be briefly stated as follows:

All fixed charges were divided into five different items and classified as follows:

	Fixed Charges.	Fire Service.	All Consumers.	Large Consumers.
Administrative	$1,400	....	$1,400	....
Collections	600	....	600	....
Interest	1,620	(50%) $810	(40% 648	(10%) $162
Sinking Fund	3,000	(50%) 1,500	(40%) 1,200	(10%) 300
Repairs, etc.	2,500	(50%) 1,250	(50%) 1,250	....
Total	$9,120	$3,560	$5,098	$462

From the above table it will be noted that it was considered that fire service was responsible for at least 50 per cent of the total cost of the system. Also the maintenance of hydrants and larger mains in connection with fire services was responsible for at least 50 per cent of the total repairs and maintenance account on distributing system. It is also to be noted that the administrative and collection accounts were charged entirely against the consumers at large. A certain proportion of the cost of a municipal water works is generally directly chargeable to the large consumer, and in the case of Catskill this was roughly estimated at 10 per cent, and 10 per cent of the sinking fund and interest charges are imposed upon the large consumer as a class by itself.

In the case of domestic or combined services, the family was taken as a consumer unit and it was found that all services could be classified into the following three classes of units as follows:

Families	1,312
Commercial Services	269
Industrial Services	11
Total	1,592

The charge of $5,098 chargeable to consumers at large is therefore to be distributed equally among 1,592 units, and a service charge of $3.20 per unit thus results.

In the case of the larger consumer there is an additional amount of $462 to be distributed among the larger services and the required revenue to meet the above amount is to be collected with relation to the size of the service in question.

Having thus disposed of the fixed charges and having met these fixed charges by a proper distributed service charge, the next consideration is the proper distribution of the operating costs involved in actually delivering water to the consumer.

Forecasting for the year 1918 the various items involved in computing the cost of delivering water to the consumer, yielded a total representing a unit cost of 4.8 cts. per thousand gallons. Allowing for a reasonable amount of leakage, waste and non-registration, it was estimated that if all services were metered, a cost per thousand gallons of less than 7c. would be impracticable.

The village of Catskill has about 180 metered services, representing about 15 per cent of the total services. A large percentage of the services are therefore charged on a flat rat basis and it was necessary to formulate a fair fixture rate which would be consistent with the cost of delivering water to the consumer and also follow very closely the meter rate for water.

The water consumption at present is about 175 gallons per capita and, as is noted above, the industrial use of water should be relatively small. Therefore only a large amount of waste or leakage can account for the large consumption of water, and from the meter records at hand various attempts were made to determine the location of this waste and what class of consumers was chiefly responsible. After several different methods had been attempted, however, the proposition was considered indeterminate and it was concluded that the only safe method of treatment would consist in distributing this waste uniformly throughout all classes of consumers. About one-half of the total amount of water consumed would represent a reasonable metered consumption for Catskill conditions and the fixture rates were figured out on the basis of a normal use of water for any particular fixture and, after compiling available meter records for commercial and industrial services and estimating the uses of water at various classes of fixtures, it was found that approximately half the volume of water was accounted for. This half of the total water consumption would be fairly distributed among different classes of consumers with a considerable degree of fairness and it was finally decided to take care of the remaining half of the total water consumption by doubling the actual cost rate per thousand gallons. This procedure put the cost rate of water at 10c. per thousand gallons for all consumers as the basis of both the metered and the flat rates. The use of water at different classes of fixtures was estimated as closely as possible and an annual rate developed which would cover the water used by such fixture at the rate of 10c. per thousand gallons.

The only additional factor to be cared for is the cost and maintenance of meters and metered services, for which must be charged an extra amount per year to cover the cost of repairs, testing, replacements, etc., and also a nominal charge to finally pay for the meter in the course of fifteen to twenty years.

We have then the following principal items in the new rates:

Certain charges applicable to all services, in the form of a service charge.

An extra service charge applicable only to large consumers.

An extra service charge to cover the cost of meter maintenance.

A water charge to cover the cost of delivering water.

A fire service charge to be collected from the village itself.

The fixed charges which accrue from the cost of fire service are shown in the above table to be $3,560. Adding to this amount a reasonable water charge for water delivered to public and charitable institutions and not paid for, there results a total charge against the village of $4,560. In the case of Catskill, the village itself always pays the maturing bonds of the water works system, together with the interest on same, the usual practice being for the Board of Water Commissioners to transfer to the village such excess revenue as might be available to assist in these payments. In any case the interest charge and bond payment charges are included in the village budget and for the year 1918 included a total of $4,620 as against the theoretical amount chargeable against the village of $4,560. The costs chargeable to the village budget are therefore met without change of present practice.

The resulting statement of rates may be tabulated as follows

Tabulation of Water Rates Per Year.

Service Charges.

¾-inch Services—	
For single family, store, office, shop, industry or other establishment, a service charge of	$3.60
Large Services—	
In addition to the above, large services shall pay the additional amounts as follows:	
1-inch service	$1.00
1¼-inch service	2.00
1½-inch service	4.00
2-inch service	10.00
3-inch service	30.00
4-inch service	50.00
Metered Services—	
For metered services, additional service charges shall be paid as follows:	
⅝-inch service	$2.00
¾-inch service	2.00
1-inch service	2.50
1½-inch service	3.00
2-inch service	4.00
3-inch service	6.00
4-inch service	10.00

Water Charges.

Faucets (including lavatories and wash tubs), per family	$2.60
Water closets (1 or 2 per family)	3.60
Water closets (3 per family)	7.00
Bath tubs (1 or 2 per family)	2.00
Bath tubs (3 per family)	4.00
Hose bibbs, sprinklers, yard or barn hydrants, per lot	4.00
Stores, offices, shops, etc. (except in special cases)	4.60
Private barn, faucets (plain), when supplied from house service	2.00
Urinals	3.60
Meter rates, per 1,000 gallons	.10
Special rate for service not included above.	

A number of test cases were worked out using the new and the old rate, and it was found that in the majority of cases the revision of rate produced an increase of approximately twenty-five to thirty per cent. In comparing the new rate with the old, it was at once apparent that in the case of services with few fixtures, the old rate produced a revenue which barely paid the fixed charges on the system and allowed practically nothing for the cost of delivering water to these services. It was also noted that some rates would be reduced, especially in the more elaborate houses, due to the fact that, on the old rate, charges were included for additional fixtures of any one kind, whereas the new rate involved additional charges only in the case of three fixtures of the same kind per family. It was assumed that, except for leakage, two toilets and two baths in a one-family house would probably represent no larger consumption of water than one toilet and bath. It was also assumed that if there were three toilets and three baths in one house their presence would indicate either a large family, above the normal, or a large contingent of servants with the probability of an increased use of water.

Commercial and industrial services are now metered as a rule. The continuation of this metering policy is practically necessary to cover complex services where the family rates can hardly be applied with fairness to the consumer or the water revenues.

The WEEK'S NEWS

Road Financing in Oregon and Iowa—Boston to Investigate Street Improvements—Free Anti-Typhoid Inoculation by U. S. Public Health Service—New York Service Commission Warns Against Gas Standard Reduction—St. Augustine Police Chief Removed—Financing of Public Utilities During War—New City Managers in Manistee and Alpena, Mich., and Winchester, Va.—Scranton Garbage Men Strike—Indianapolis Buys Garbage Plant—Zone Fares in Pittsburgh.

ROADS AND PAVEMENTS

Oregon's Road Budget.

Salem, Ore.—According to the budget of the state highway commission for the year a total of $2,265,602 will be required to complete highway projects in process of construction, make surveys and defray the administrative expense of the highway department. Of this total all save $892,629 is available, and an application is now pending before the national capital issues committee for permission to sell bonds to raise this sum. To complete work under way $1,484,078 will be needed, and $1,176,092 will be derived from the $6,000,000 fund, and $307,985 under the millage law. For co-operation with the government on projects $591,524 will be needed under the Bean-Barrett act. For administration $75,000 will be required; for equipment and stock, $40,000, and for surveys, $75,000. Under the millage law there is available the sum of $538,148; under the $6,000,000 paving act the sum of $486,707, and under the Bean-Barrett act $388,280, making a total of $1,413,136.

Counties Share Auto License Fund.

Des Moines, Ia.—The state treasurer recently completed the distribution of automobile license money to the various counties of the state. The total amount of money sent out was $738,130, which is at the rate of $446 per township to each of the 1,655 townships of the state. Out of the spring license money this year $252,000 is to be utilized for road improvements to match a similar amount put up by the government. So that in reality the state is distributing $990,130 at this time. A year ago the state distributed $1,094,000 auto license money, $103,870 more than this year. About 70,000 more cars have been registered this year than last. The smaller amount of money taken in is explained by the secretary of state's office to be due to the increasing number of cars which have been owned four years or longer and are therefore paying only a half rate. There is also a considerable sum which is delinquent, but which the secretary of state's office hopes to collect. Under the present law providing for the distribution of the auto license money according to the number of townships the counties of the state with the largest area get the most money. Kossuth county, with 29 townships will get $12,934 in the present distribution and Pottawattamie, with 28 townships, will get $12,488.

Committee to Investigate Street Problem.

Boston, Mass.—Under the legislative act which permits an increase in the tax limit for the current year authority was given to appropriate for street construction and repair, by contract, a sum equal to the yield of one dollar on each one thousand of valuations, on which appropriation of the city council are based. The sum of $1,541,598 is thus made available. To aid the city in determining how much of this amount it is wise to appropriate the mayor has appointed a committee, whose duty shall be to investigate and report its findings and recommendations to the chief executive and the city council. The committee shall prepare a list of streets which imperatively demand repair at the earliest possible moment, and such other streets in the order of their importance. As a result of the plan of the mayor the following committee has organized, with men from commercial bodies of large membership cooperating for the common good": Howard Rogers, chairman, representing the mayor; James J. Storrow, representing the city council; Francis R. Bangs, representing the real estate interests; Frederick H. Fay, representing the chamber of commerce; Edward F. McGrady, representing the Central Labor Union. The city has thus finally adopted a business-like system for the repair of our streets, and the officials promise that hereafter the results will be highly beneficial. According to mayor Peters, "There should be a study of the whole highway problem in the city by experts, with a view to having in mind a comprehensive plan for street improvements when the return of normal conditions permits street work on any considerable scale. The amounts which have been appropriated heretofore for the improvement and the repair of highways have been found woefully inadequate, and provisions must be made for more generous allowances. A new policy must be attained, with an equally radical change in the methods of making street improvements and repairs. No longer should the improvement of a highway depend upon caprice or political expediency. There should be a carefully worked out plan, having in mind the amount of money that can be spared for the construction and maintenance of streets, a proper division of that money, and a systematic and intelligent outline so that the citizens can feel immediate relief from the present wretched condition of the streets and confidence that the future holds a certainty of permanent improvement."

SEWERAGE AND SANITATION

U. S. to Give Free Anti-Typhoid Inoculations.

Washington, D. C.—According to an official statement, "to protect the health of workers and others in this country at a time when the labor of every man possible is needed, Secretary McAdoo has directed that the United States Public Health Service give anti-typhoid inoculations without charge to all who apply to any of its hospitals or field offices. Many of these offices are located in zones surrounding the military cantonments of this country. The prevention of typhoid fever in these zones is one of the greatest steps toward preventing the interchange of disease between the military and civil populations. In Little Rock alone more than 15,000 civilians have been inoculated by the Public Health Service against typhoid fever. Application for inoculation should be made in person to any United States marine hospital, to any field office of the Public Health Service, or to the United States Hygienic Laboratory, Washington, D. C. Information as to the nearest place where an inoculation can be given will be furnished on application to the Public Health Service, Washington, D. C., The season of typhoid fever is now at hand, and this fact makes inoculation at this time of great importance. All persons who run any risk of drinking contaminated water should certainly be inoculated. The effectiveness of this measure in preventing typhoid fever is recognized by the army and navy authorities, and all soldiers and sailors of the United States are inoculated when they enter the service. As typhoid fever is conveyed by swallowing germs previously excreted by typhoid patients, the Public Health Service is making every effort, especially in the vicinity of the camps, to improve the means of disposal of human excreta, through both education and demonstration. The states and localities are co-operating in the work, and in a number of cases have appropriated large amounts for this purpose. For instance, Congress last year passed a law appropriating money to be spent by the Public Health Service for demonstrations in rural sanitation in localities where an equal amount was appropriated by the state or local authorities. Under this law states and localities have already appropriated over $70,000 in the present fiscal year."

City and Contractors Responsible for Sewer Error.

Niagara Falls, N. Y.—The board of arbitration designated to hear the Buffalo avenue sewer case has decided that the city and the contractors, Donnolly, Graham and Gibbons, were jointly responsible for the errors that resulted in an additional expense of about $10,000 in laying the sewer. Responsibility for the errors rests on the city because levelmen did not provide sufficient stations in giving the grade, and on the contractors because they did not obtain the correct grade from the city engineer when they discovered the error.

Predicts Militarized Medical Profession.

Indianapolis, Ind.—A militarized medical profession under orders from the United States government was predicted by Dr. J. N. Hurty, acting state health chief, as the alternative unless physicians comply with the government request to stamp out the venereal disease menace. Dr. Hurty was one of several speakers at a conference of health officers of the state held here. "Physicians who do not comply with the new state law, which provides that all cases of venereal disease be reported to the state health authorities, are aiding the enemy," declared Dr. Hurty. "The old objection to reporting—the fear of publicity—has been done away with now and there is nothing to stand in the way. The state must know where these carriers of disease are. Quarantine is necessary only under certain circumstances. In the cases of those afflicted who lack money to provide proper treatment for themselves a way will be found to take care of them. The menace must and will be stamped out. If it is not stamped out—if doctors do not take steps to kill it—I learn from good authority that we may expect to see a militarized medical profession in this country." A general movement to pass city ordinances in all cities of the state to regulate the diseases was started. New Albany and Jeffersonville, Dr. Hurty said, have appropriated money for treatment already, and many other cities will follow. Health officers were urged to take the matter up with their city councils.

WATER SUPPLY

Commission Decides Contract Details.

Homestead, Pa.—The state public service commission has issued a decision in an unusual case, announcing upon what terms it would approve a contract if submitted. The borough of Homestead has been negotiating with the South Pittsburgh Water Company for a supply of water, complaints having been made by citizens against the municipal supply. The commission, in its decision, says the contract should provide for commission approval; that it should provide for annual testing of meters by the water company at its expense; that any purchase must be approved by the commission, and that the borough should not be obligated to pay the charges fixed in the contract as soon as the pipe lines to be laid by the water company have been installed unless there is a provision protecting the borough by reason of failure to install meters for its consumers.

City Takes Over Water Works.

Hagerstown, Md.—The Washington County Water Works, with all rights, privileges, franchises, etc., has been formally transferred to the city of Hagerstown, the purchase money paid over and the deed duly recorded. The purchase price was $1,150,000, of which $300,000 in bonds was assumed by the city and the balance was settled for in cash. The stockholders will either receive money for their stock or accept the bonds issued by the city. The city sold a few days ago $850,000 worth of bonds, which were purchased by Robert Garrett & Sons, Baltimore, and the National City Company, New York, and the money received from this sale will be used to complete the transaction. The present office force of the water company will remain the same as heretofore, and while it has not been officially announced, it is understood that Mr. Albert Heard, the present executive manager, will be retained in the same position by the city. At an election on the question the people approved municipal ownership of the works by a 3 to 1 vote.

City Has Right to Buy at Commission's Values.

San Rafael, Cal.—The right of municipalities to condemn the property of a public utility corporation and absorb it on payment of the sum set as its value by the state railroad commission has been upheld by the supreme court. The court affirmed the decision of the lower court in the cases of the Marin Municipal Water district against the Marin Water and Power Company and the North Coast Water Company. Under the decision of the court the Marin Municipal Water district was authorized to take over the property of the former company on payment of $1,200,500 and the latter's for $289,200. The Marin Water and Power Company based its protest against the action on allegations that the court should set a higher valuation. The supreme court, however, held that the court was bound by law to take the commission's figures; that the company was not entitled to any increase in value, which came about following the assessment of the property and prior to the completion of the transaction, and that the law under which the condemnation proceedings were brought was constitutional.

STREET LIGHTING AND POWER

Commission Warns Against Lower Gas Standard.

New York, N. Y.—The public service commission for the First District has asked W. L. Requa, Oil Fuel Administrator in Washington, for a conference in reference to possible action of federal officials affecting the quality of illuminating gas as sold throughout the country. Information has reached the commission that action is contemplated which will have the affect of reducing the quality of gas furnished to consumers by an order limiting the gas oil supply of gas companies through the imposition of a maximum standard of quality of gas that may not be exceeded. It has been reported to the commission that the Fuel Oil Administration has considered the fixing of a standard of 528 B. t. u.'s, which the gas company must not exceed on condition of being deprived of all oil supply. The public service commission for the First District pointed out to the Fuel Oil Administrator that any reduction in B. t. u.'s without corresponding reduction in price of gas would act as a hardship to gas consumers in New York City. Last October the gas companies here appeared before the commission on the question of changing the standard of gas from twenty-two candle power to the B. t. u., or heat basis. Then came the question of the number of units it would take to make gas equal to the legal standard of twenty-two candle power. The companies fought for a low basis because cheaper gas could be made and more would have to be used to get the same results. Finally the commission fixed the standard at 650 units, but gave the companies the privilege of accepting this offer or rejecting it as they pleased. They made no move, and the old candle power standard has continued to prevail. When it was learned that the Washington authorities were interesting themselves in the matter the commission feared that any interference with its control of public service corporations by representatives of the Federal Government might weaken public supervision to the extent of making any further orders of the commission of no avail. Public service commissioner Travis H. Whitney said that if the gas companies in this city were losing money and needed an increase in their net earning they should apply to the commission and present the necessary evidence. He added that if the heat basis was fixed at [illegible] unless it would have startling and far-reaching results to the public in every section of the United States. Mr. Whitney explained that the commission here realized that a limitation in the use of oil might become necessary, and that if this proved to be the case that the Oil Administrator was the one to make the proper apportionment among the companies. Then he said: "If, however, he determines upon such a necessity and the fixing of a maximum standard of quality that must not be exceeded by a gas company under pain of being cut off from any supply it seems worthy of consideration that he also imposes on the gas companies a still further limitation that they shall preserve, as a condition of receiving oil, the relationship between quality standard and rates that now exist in the various cities." Mr. Whitney said that the commission had already given the companies permission to reduce the quality providing that they lower the price, but the companies did not seem to care for such a privilege. "The needs of the Government for toluol are extremely urgent. The best available source for the extraction of toluol is the larger gas companies. The amount of toluol that may be extracted from gas varies directly with the quantity of oil used in the production of gas. If there is used four and one-fourth gallons of oil per 1,000 cubic feet of gas, which is the actual situation in New York, in order to produce gas of a legal quality, and by arbitrary order the quantity of oil is limited to two and one-half gallons per 1,000 cubic feet, the amount of toluol is reduced proportionately."

Muoicipal Plant Raises Rates.

Hagerstown, Md.—The street commissioners have filed a new lighting and power schedule with state public service commission to become effective June 25. The new rates represent an increase on lighting schedule varying from 15 per cent to 25 per cent and on the power schedule a greater increase. The new rates represent an average resultant increase in the revenue to the plant of approximately 20 per cent. The city light plant has felt the effects of the large increase in the price of coal, labor, and supplies during the past year. Based upon the prices for fuel and labor in 1915 the total cost of operation at present time is estimated to be over 50 per cent greater. To keep pace with the increase operating costs, and to keep up the general maintenance work, the revenue must be increased. It is due only to the increased business of the past year that the light plant has been able to partially meet the situation.

New York to Retain Seven-Cent Rate.

New York, N. Y.—The rate of seven cents per kilowatt hour charged by the New York Edison company for electric current is not to be increased, although the consumption has fallen off and the general costs of manufacturing have increased. The rate was eight cents prior to 1917. Then it was reduced to seven and a half cents for the first six months of that year and to seven cents for the last six months. It was understood at the time the reductions were made that at the expiration of 1917 the company would have the right of increasing the cost if it could prove to the satisfaction of the public service commission that the low rate failed to yield a reasonable return on the investment. J. W. Lieb, vice-president and general manager of the company, appeared before the commission and made a statement to the effect that the doubts and fears expressed by the company nearly a year ago in relation to a steady increase in the cost of manufacture had been realized. Then he said:

> "Our revenue has suffered a considerable decrease due to the reduction in rates, while our output has been actually less than last year. Our expense account has shown a steady increase as compared with last year in the price of coal and labor, and, in fact, in the supplies of every description concerned with articles of consumption and of those needed in [illegible] and maintenance.
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> "Our records show that for the four months ended April 30, [illegible] as compared with 1917, our operating income has been reduced from $[illegible],621,723 in 1917 to $2,6[illegible]3,069 in 1918, a total of [illegible] for the four months. Net income, therefore, suffered [illegible]. What the future may have in store for us it is difficult to predict. In fact, with the rapid changes [illegible] taking place we can only express our doubts and [illegible]
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> "The loss in our operating revenue is not entirely accounted for by the reduction in the maximum rate from 7½ cents to 7 cents, which went into effect July 1, 1917. It is now disquieting, to say the least, that the reduction in the quantity of current sold was from 223,061,388 kilowatt hours for the first four months of 1917 to 213,513,941 in 1918, a reduction in the output in excess of 4½ per cent.
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> "The increase in operating expenses in 1918 and 1917 is a reflection of the increased cost of coal, of labor, supplies, and taxes, and, with the exception of coal, the future price and efficiency of which is at this time problematical, these higher costs will continue, and possibly in an increasing ratio justify the company in going back to the 8-cent rate. At the throughout the year. We believe that these conditions would same time it is not absolutely certain that the decreases in output will continue for the balance of the year.
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> "The present situation is one of extreme doubt and uncertainty. We do not desire to come before the commission at this time and announce our decision to restore the 8-cent rate. We believe that probably the best solution would be a continuation of the present arrangement with the commission, maintaining the status quo for another six months, and reserving such rights as we have under the present arrangement."

The commission agreed to this. The agreement affects practically all points in Manhattan and the Bronx, because the United Electric Light and Power Company, a subsidiary of the Edison Company, is a party to the agreement. At the time the rate was lowered, it was understood that the decrease of every half cent in the rate meant a saving to the consumers of $750,000 every six months. The company also announced that while it would continue to furnish lamps it would be compelled to charge for them, and that the prices would be in line with the general increases made by the manufacturers.

FIRE AND POLICE

Firemen Strike for More Pay.

Sedalia, Mo.—Following the refusal of the city council to grant the firemen of this city an increase in pay of $15 a month the force, seven men, with the exception of chief William H. Paul and assistant chief Frank Kaler, walked out. The men had asked for $90 a month instead of $75 and the council had agreed to an advance of $10.

Police Chief Removed.

St. Augustine, Fla.—Chief of police Quigley has been removed from office by city manager Masters. Something of a sensation was created by the suddenness of the removal, as no intimations had been given in advance and the public was not expecting any change in the police department. When asked what charges he had preferred against chief Quigley, manager Masters stated that he had made no charges, but simply removed him for cause. When asked what the cause was he answered it was inattention to duty. He said that since he became city manager the ordinances have not been enforced, and that the public is looking for the best possible service from the police. Captain Coxe has been promoted to the position of chief, effective at once. Captain Coxe has been on the police force for several years. The office of captain of police has been abolished.

Fine Fire-Fighting at Big Oil Blaze.

Pittsburgh, Pa.—Damage amounting to $250,000 and one of the finest displays of expert fire-fighting seen in Pittsburgh in recent years were the results of a spectacular fire which destroyed the greater part of the Gulf Refining Company's plant in Junction Hollow, together with 35,000 gallons of lubricating oil and 500 gallons of gasoline. The refining buildings suffered damage to the amount of $100,000 and damage to equipment and oils reached $150,000. A solid barrage of water through an alleyway 20 feet wide, maintained in an intense heat by plucky firemen, was the only thing that prevented 135,000 gallons of gasoline in nine large tanks from being destroyed and resulting in another local catastrophe. The alarm of fire was first sounded by the engineer of the plant. Two minutes after the first firemen arrived two more alarms were sent in. Chief William Bennett and assistant chiefs George Powers and Frank P. Kelly, who arrived with the last alarm, had seven fire companies. Two companies of apparatus and workmen of the refining company with six hundred feet of company hose were assigned to protect, if possible, the gasoline tanks. The task once attempted could only be ceased under pain of death; if the wall of water failed for an instant all in the vicinity would have almost certainly lost their lives. Five large mixers and four refilling tanks were in the main building, as were several hundred barrels of lubricating oil. During the fire great volumes of smoke rolled out of the valley as the successive rows of barrels caught the blaze. A strong west wind swept the rolling smoke into the homes surrounding the valley and all were vacated. Electricians working in the basement of the plant are blamed by the general manager for the disaster. He claimed that a short circuit in a piece of metal conduit with which they were working had originated the blaze among the oil barrels. Traffic on the main line of the Pennsylvania Railroad was tied up for an hour by the fire. All the companies which answered the three alarms were still playing water on the fire at midnight after nine hours' work.

Whole Force at Power Plant Fire.

Galveston, Tex.—Fire which was discovered in the roof of the Brush Electric company's power plant caused damage estimated at about $50,000 and resulted in a cessation of electrical service to the company's customers for several hours. Due to the fact that one of the boilers and two of the turbine engine generators of the plant were put out of commission for only a short time and that connections were quickly made with the plant of the Galveston Electric company, service was restored over practically all circuits of the Brush company in half a day. Later on in the day considerable additional power was available from the plant of the Galveston-Houston Electric company at League City. The blaze was discovered shortly after 2 o'clock in the morning on the roof of the plant near the big smokestack. A general alarm was quickly sounded and the whole fire-fighting force of the local department responded and had a hard time confining the flames to the roof of the southwestern part of the building. This whole section of the roof either burned or caved in onto part of the engine-room and boiler-room. Firemen were kept busy putting out blazes in various parts of the debris during the morning and a blaze in some fuel oil caused another alarm to be sounded. This blaze, however, was quickly disposed of.

GOVERNMENT AND FINANCE

War Finance Corporation on Public Utilities.

Washington, D. C.—The War Finance Corporation finds the heaviest end of its business to be the consideration of applications for loans from the large capitalization placed by Congress in the control of the corporations. The directors issued the following statement, quoted in part: "The resources of the War Finance Corporation are not intended to be loaned directly to war industries unless in an exceptional case, but only indirectly through the banks. As the Secretary of the Treasury stated before the committee of Congress when the bill was under consideration, 'The provision of the bill permitting direct loans by the corporation in exceptional cases is intended to provide for those rare instances where it may be made to appear to the corporation that a meritorious borrower is being unwisely discriminated against by the bank.' From the applications received by the War Finance Corporation there seems to be an impression in certain quarters that the corporation was specially designed to provide funds for meeting maturing obligations, particularly those of public utility companies. The law expressly provides that the corporation shall not make direct advances to provide funds to meet such maturing obligations, except possibly in some rare case which could clearly be brought within the 'exceptional cases clause.' Of course, the corporation will stand ready to lend its assistance to banks and bankers in proper cases where they have themselves made advances to war industries, whether for the purpose of meeting maturing obligations or otherwise, and direct advances in deserving cases that come clearly within the provisions of the law. Holders of maturing obligations, whether of public utilities or of other concerns which may find themselves unable, because of temporary conditions, to meet their commitments punctually should consider whether, in the public interest, as well as their own, they should not co-operate by consenting to reasonable renewals. Public utility companies particularly in co-operation with the communities in which they operate should have the opportunity of adjusting themselves to the changed conditions brought about by the war. No machinery has been specially provided for direct purchases of obligations of the public utilities, whether to meet maturities or otherwise, either through the War Finance Corporation or through any other governmental agency. The situation of these public utility companies is, therefore, quite different from that of the railroads, where Congress has made specific provision for the purchase of their securities by the government in certain exigencies, yet even the railroads are expected, wherever possible, to meet their own maturities and to pay what the money is worth to accomplish that end. It must be remembered that the railroads are under federal operation, and that their rates are subject to federal control, and that the government therefore is in a position to see to it that their charges shall be sufficient to meet the cost of the service rendered. In the case of the public utilities, however, neither their operation nor their rates are subject to federal control. Wherever the charges do not amount to adequate compensation for the services rendered relief can be had only through the appropriate local authorities, and time is essential to enable the companies and the communities in which the operate to reach a satisfactory solution of this important problem. It is not a problem which can be disposed of by having the federal government through the War Finance Corporation assume the burden of financing the operations of these local companies, except in exceptional circumstances which may make it a matter of national importance that advance should be made. The local authorities will no doubt respond as promptly as possible in cases where relief is needed because of changed conditions, as it is clear that the soundness and efficiency of public utilities is intimately connected with a vigorous and successful prosecution of the war."

New City Managers.

Manistee, Mich.—Philip H. Beauvais has been appointed city manager to succeed Charles E. Ruger, who had served since the commission-manager plan was adopted in 1913. Mr. Beauvais has a long record of achievements as an engineer and resigned the position of superintendent of construction of Manistee's half-million-dollar breakwater to became manager.

Alpena, Mich.—To fill the vacancy caused by the resignation of Harrison G. Roby, Charles T. Park has been appointed city manager. Former manager Roby is now second lieutenant in the service, and is located at Quantico Marine Barracks, Va., where he is in charge of construction of water supply improvements.

Winchester, Va.—Thomas J. Trier, assistant city manager, has assumed full managerial duties in place of Arthur M. Field. City manager Field is away on leave of absence for service for the duration of the war with the engineering department of the Bureau of Industrial Housing at Washington.

City Employes Get Raise.

Portland, Ore.—Salary increases for all city employes receiving less than $150 a month, made possible through the adoption of a special 1-mill tax amendment, have been approved by the council and are now in effect. In some isolated cases increases for men receiving more than $150 were allowed where such increases were necessary to retain the services of the employes. Many technical men are remaining in the service of the city for less salaries than they have been offered in industrial positions. Firemen, policemen and laborers received the greatest benefit from the increases, although others in the technical and clerical forces were granted advances in pay. Laborers heretofore receiving $3.25 a day will be increased to $3.75 and others receiving $3.50 a day will be increased to $4. Heretofore firemen and policemen have received a minimum of $85 a month and a maximum of $110. Under the new schedule they will receive a minimum of $100 and a maximum of $125. New men will start with the minimum and their pay will be advanced $5 each six months until they receive the maximum pay. Other employes in the service of the city who receive $100 or less were granted approximately a 15 per cent. increase; those receiving between $100 and $125 an increase approximately 10 per cent., and those receiving from $125 to $150 an increase of approximately 5 per cent. The salaries of captains of police were all made uniform at $175 a month, and all detectives at $150 a month. The members of the war emergency squad will receive $130 a month. The total amount of the increases granted will approximate $115,000 for the remainder of this year.

STREET CLEANING AND REFUSE DISPOSAL

City Loses Garbage Fight.

San Diego, Cal.—A man may haul his own garbage to feed his own hogs, the city ordinance to the contrary notwithstanding. This is the substance of a lengthy decision handed down by justice George Puterbaugh on the test case brought under the ordinance by the city against the proprietor of a cafeteria. In effect, unless appealed by the city and reversed by a higher court, this decision nullifies the contract entered into by the city with F. A. Binney & Co., giving that concern an exclusive right to collect all garbage in the city, and the ordinance which provides that all garbage possessors must give up their property to the city's contracted garbage haulers. When taking the contract and making necessary preparations to take care of all the garbage hauling the Binney company insisted that it be given all garbage in the city, and have since insisted upon having it as its due under the contract. The city prosecuted the test case in an effort to live up to its terms.

Garbage Employes Strike.

Scranton, Pa.—Tying up completely all garbage and ash collecting as well as stopping the cleaning and repairing of all city streets, 350 employes of the department of public works went out on strike to force an increase in wages and the correction of all alleged grievances based on the charge of discrimination against employes belonging to the City Employes' union. Not a pound of ashes or garbage was collected the first day. Mayor Connell stated that he has left the strike and its settlement in the hands of director of public works Allen, but promised to take hold himself if there is not a prompt adjustment of the matters in dispute. Both the mayor and the director charged the striking employes with taking "an unfair advantage of the city six months after the matter complained of was put into effect and at a time when the city is helplessly unable to do anything other than what it has done for six months." The strike is a sequel of the settlement of the previous walkout in December last, when the employes of the department enforced their demands for wage increases. That strike was settled when the men's committee headed by S. J. McDonald, president of the Central Labor union, adjusted the demands in conference with the then mayor, E. B. Jermyn, and the then director of public works, W. G. Robertson. The wage scale was agreed to in all particulars except the wage for street laborers, park laborers and unpaved street laborers, and which was finally adjusted on the basis $2.35 for this class of labor. This rate of wage has been paid to the men since the 1918 appropriation ordinance which fixes salaries and wages of all officials and employes was passed by council. It is now charged by the men leaders that the rate of wages should be $2.[illegible] a day for this class of labor. Aside from the wage matter the men charge that the director has discriminated against union members. Director Allen flatly denied this charge. It is also complained that at times men under one classification paid a certain rate of wages under the ordinance classifying men and wages, are shifted to work that pays less.

Garbage Plant Bought By City.

Indianapolis, Ind.—The city board of sanitary commissioners has decided to purchase the garbage collection and hauling equipment and reduction plants of the Indianapolis Reduction company. The company's six-year contract for garbage collection and disposal recently expired. The contract provided for a payment of $48,000 a year, with $1,000 added for annexed territory. In December, 1917, the company was the only bidder for a new contract, at a price of $87,900. The commissioners advertised for bids for a collection and disposal plant. The company's bid was $175,000. The valuation placed on the plants by the commission's engineers was $179,645. The collecting and hauling equipment consists of 65 wagons of 1½-ton capacity, 245 steel box beds and covers; 65 mules and heavy draft horses; eight standard-gage 40-ft. railway flat cars; a loading station located about a mile from the center of the city, and some minor equipment. The reduction plant has a capacity of 145 tons of green garbage per day of 24 hours and includes sixteen digestors, a dryer, a percolator, a number of conveyors and four 150-hp. boilers.

TRAFFIC AND TRANSPORTATION

Zone Fares Follow Pittsburgh Higher Rates.

Pittsburgh, Pa.—The Pittsburgh Railways, now in the hands of receivers, are to charge a new schedule of rates of fare beginning June 20. In the majority of cases the fare is 7 cents, but on all lines a point is designated to which a ride may be had for 5 cents, based closely on a radius of 2 miles from the center of the city. Where there is a loop at or near the 2-mile point this is usually selected as the limit of the 5-cent fare. Five cents will be charged on the crosstown line, but transfers from those cars to other lines for a ride beyond the 2-mile limit will be charged for at 2 cents. No tickets will be sold in lots of less than eight, and the charge for eight will be 55 cents. Six-cent fares in Pittsburgh are abolished, but for municipalities surrounding the city and on lines of the company they will be the rule within the municipal limits, except that McKeesport will have a 5-cent fare somewhat similar to that prescribed for Pittsburgh. The company has issued a booklet giving the details of the increases in fares.

City Forces Company to Pay Bridge Cost Share.

Seattle, Wash.—The city is victorious in its fight against the Puget Sound Traction, Light & Power Company to collect $60,917 as the company's share of the cost of constructing the Fremont Avenue bridge. The suit was heard before Judge Calvin S. Hall in the King County Superior Court, before whom the jury also returned a special finding that the company was not entitled to damages for the removal of the Stone Way bridge. Last July the traction company filed a counter claim for $210,000, alleging this to be the amount of damages sustained by the company as the result of the removal of the Stone Way bridge. The jury disallowed this claim and upheld the city in all of its contentions. The Stone Way bridge was ordered out by the United States Engineer's office, and was demolished after the Fremont bridge was completed and ready for traffic. As a result of the verdict the company must pay the city of Seattle not only $60,917, but interest on that amount from June 15, 1917, and $333 a month as the company's share of the cost of maintaining and operating the bridge. A price of 1 cent a kilowatt-hour was allowed the city for current used on the bridge by the company in operating its cars since June 15, 1917.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on muncipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

Roads and Streets.

Designing Highways:

Choosing Proper Grades for Various Types of Pavements. By William Alden Brown, asst. city engr. of Providence, R. I. 1,200 wds. Municipal Engineering, May. 30 cts.

Highway Widths. Paper before the Canadian Good Roads Congress. By F. Howard Annes. 1 ill., 1,000 wds. Canadian Engineer, May 16. 15 cts.

Economic Highway Transportation. Discussion of the advantages of cut-offs under various conditions, illustrated by calculations of several cases. By Robert C. Barnett, Engr. Missouri State Highway Dept. 7 ills., 4,000 wds. Good Roads, May 11. 15 cts.

Design of Streets for Suburban Communities. From a lecture by Francis A. Robertson. 1,100 wds. Engineering and Contracting, May 1. 15 cts.

Building Highways:

Road Building at the Front. How good roads in France are helping win the war. Planks and large stone the most valuable materials. By Lt.-Col. Wm. G. MacKendrick. 2,000 wds. Canadian Engineer, May 16. 15 cts.

The Motor Truck and Trailer in Road and Street Building, Repair and Maintenance. General discussion. 29 ills., 18,000 wds. Better Roads and Streets, May. 20 cts.

Paying for Highways:

Who Should Pay for the Roads? Papers before the Canadian Good Roads Congress. By Hugh Bertram and W. A. McLean. 5,000 wds. Canadian Engineer, May 16. 15 cts.

Paving and Grading Assessments on Simple Basis. Standard method in use for four years has given satisfaction to property owners in practically all cases. By George H. Ruhling. 5 ills., 900 wds. Engineering News-Record, May 23. 20 cts.

Highways and the War:

Using Motor Highways to Meet the War Emergency. From address at War Roads Convention. By W. O. Rutherford. 2 ills., 2,000 wds. American City, May. 40 cts.

Military Road Building Difficult Even in America. Experience last winter shows maintenance to be principal item. New type of permanent highway recommended. By Capt. Frank W. Harris, U. S. A. 1,800 wds. Engineering News-Record, May 16. 20 cts.

Keep Main Roads Open as a War Measure. Good highway essential to overland transportation of war supplies. Motor truck freight helping to keep business on even keel. 1 ill., 1,500 wds. Southern Good Roads, May. 15 cts.

Military Highways. Paper before Franklin Institute. By Logan Waller Page. 8,000 wds. Journal of the Franklin Institute, May. 60 cts.

The Efficiency of the Highway in the Present Transportation Difficulties. Paper before the Canadian Good Roads Congress. By Col. Wm. D. Sohier. Canadian Engineer, May 16. 15 cts.

More and Better Highways and Bridges Must Be Built for Increased Truck Traffic. Shortest possible routes, parallel roads and snow removal. By Geo. C. Diehl. 1,600 wds. The Commercial Vehicle, May 1. 25 cts.

Bituminous Roads:

Hot-mix Bituminous Construction, Using Asphaltic Binder. Paper before Canadian Good Roads Congress. By E. Drinkwater. 4 ills., 1,500 wds. Canadian Engineer, May 16. 15 cts.

Maintenance of Asphalt Pavements in Ottawa. By L. McLaren Hunter, City Engineer's Office. 2 ills., 1,000 wds. Canadian Engineer, May 2. 15 cts.

English and American Practice in the Construction of Tar Surfaces and Pavements. Paper before the Canadian Good Roads Congress. By Arthur H. Blanchard. 8 ills., 5,500 wds. Canadian Engineer, May 30. 15 cts.

Tar for Bridge Floors. Description of use at Stillwater, Minnesota. 700 wds. Municipal Journal, May 25. 10 cts.

Concrete Roads:

Construction Plant and Methods Employed in Building Reinforced Concrete Roads at Camp Custer. By George A. Burley. 3 ills., 2,200 wds. Municipal Engineering, May. 30 cts.

Wear-Resisting Values of Various Aggregates for Concrete Roads Indicated. New machine generates impact stresses which closely parallel those set up by traffic, whether horse-driven or motor-driven. Tests made on paving brick furnish interesting results. By H. S. Mattimore. 3 ills., 1,500 wds. Engineering News-Record, May 2. 20 cts.

Macon Concrete Paving Roller. Instructions for its use. 800 wds. Engineering and Contracting, May 1. 15 cts.

Rolling and Belting Concrete Pavements. Hints by A. R. Chambers, city engr. of Logan, Utah. 800 wds. Engineering and Contracting, May 1. 15 cts.

Methods and Cost of Constructing a Concrete Road in Southern California. Gives itemized cost figures. By E. Earl Glass. 3 ills., 1,500 wds. Engineering and Contracting, May 1. 15 cts.

Railway Crossings Paved with Precast Concrete Slabs. Description of some instances of their use. 2 ills., 800 wds. Engineering and Contracting, May 1. 15 cts.

Concrete Railroad Crossings Proving Successful. Slabs found cheap, durable and easily removable; iron-bound edges resist wear. Concrete planks also used. 6 ills., 800 wds. Engineering News-Record, May 23. 20 cts.

Replacing Defective Road Slabs. Methods of doing so discussed by A. N. Johnson and J. E. Conzelman. 1,000 wds. Concrete, May 25 cts.

Brick Pavements:

Some Design and Constructional Features of Modern Brick Pavements. By F. A. Churchill. 6 ills., 2,000 wds. Municipal Engineering, May. 30 cts.

Coarse Sand Proves Superior for Vitrified Brick Grout. On two jobs, where contractor, engineer, foreman, inspectors, labor, brick and cement were same, value was apparent. By Job R. Rogers. 800 wds. Engineering News-Record, May 16. 20 cts.

Brick Pavements for Rural Highways. Discusses use of bituminous fillers, small brick, monolithic construction, and macadam base. 800 wds. Municipal Journal, May 18. 10 cts.

Stone Block:

Design and Construction of a Granite Block Pavement. General discussion of modern pavements of this kind. By George W. Tillson. 3 ills., 3,300 wds. Municipal Engineering, May. 30 cts.

Paving along Street Railway Tracks. Methods employed in Toronto, where granite block is the standard, although asphalt has given promising results. 10 ills., 2,500 wds. Canadian Engineer, May 9. 15 cts.

Wood Block:

Destruction of Wood Block Pavement Due to Use of Tar in the Creosote Oil. By P. C. Reilly, of the Republic Creosoting Co. 4 ills., 800 wds. Municipal Engineering, May. 30 cts.

Wood Block Bridge Floors. Experience with their use by Illinois Highway Department. 350 wds. Municipal Journal, May 25. 10 cts.

Pitch Paint Coat Method of Wood Block Pavement Construction. Specifications of the American Wood Preservers Association. 700 wds. Engineering and Contracting, May 1. 15 cts.

Miscellaneous:

Improving Country Roads. A plea for more intelligent maintenance of low cost roads. 1,000 wds. Municipal Journal, May 18. 10 cts.

Abatement of the Dust Nuisance. Discussion of the various methods employed. By E. R. Gray, city engr., Hamilton, Ontario. 2 ills., 1,500 wds. Canadian Engineer, May 16. 15 cts.

Canadian Good Roads Congress. Description of the doings of the nith annual convention. 6,000 wds. Canadian Engineer, May 16. 15 cts.

Road Progress in Texas During the Year. Statement of work done and money available. By T. P. Mosh. 1,800 wds. Southern Good Roads, May. 15 cts.

Ethics of Highway Engineering. Relations between engineers, engineer and contractor, etc. By W. C. Riddick. 2 ills., 3,000 wds. Southern Good Roads, May. 15 cts.

Centralized Road Building Policy under Government Control. Suitable motor-truck highways of great economic value and military advantage during and after the war. By S. M. Williams. 2,500 wds. Commercial Vehicle, May 15. 25 cts.

Sewerage and Sanitation.

Sewage Treatment:

Sewage Treatment Plant at Alliance, Ohio. Description of recent improvements, including installing two-story tanks. By R. Winthrop Pratt. 5 ills., 2,000 wds. Municipal Engineering, May. 30 cts.

Sewage Treatment at Columbus. First year's operation of the two-story settling tanks that replaced the original septic tanks. Odor and sludge give less trouble, but insufficient capacity of sprinkling filters causes unsatisfactory effluent. 2,300 wds. Municipal Journal, May 18. 10 cts.

Fertilizer Value of Activated Sludge. Ten crops show increase in yield ranging up to 554%, and averaging 179% using activated sludge as compared with manure. 8 ills., 4,000 wds. Canadian Engineer, May 2. 15 cts.

Design of Sewage Treatment Works. Discussion of general arrangement, accessibility, treatment of exterior, etc. By John H. Gregory. 1,500 wds. Municipal Engineering, May. 30 cts.

Irrigating with Sewage at Tucson. Nearly 500 acres of arid farm land to be irrigated following 17 years of experience by the city. By W. C. Lefebvre. 1,100 wds. Municipal Journal, May 11. 10 cts.

Typical Rules for Operation of Small Sewage Works. Should be placed in a tool house on premises where the inevitable "new" man may easily locate them. 1,100 wds. Engineering News-Record, May 2. 20 cts.

Sewer Joints:

Making Tight Joints in Pipe Sewers. Some experiences with G. K. compound. By W. W. Dixon. 1 ill., 900 wds. Municipal Engineering, May. 30 cts.

Sewer Pipe Joints. Experiences of a number of engineers in securing tight joints by use of cement, sulphur-sand and bituminous compounds. 2,000 wds. Municipal Journal, May 18. 10 cts.

Sewer Pipe Joints. Conclusion of article giving experiences with sulphur-sand, asphaltic and linseed oil compounds. 1,500 wds. and table. Municipal Journal, May 25. 10 cts.

Miscellaneous Sewerage:

Cleveland's Sewerage System. Studies of rainfall, house sewage flow and capacities of existing sewers made basis of design. 3 ills., 1,400 wds. Municipal Journal, May 25. 10 cts.

Concrete Pipe Laid on Lake Bottom. Outfall sewer for Cleveland, Ohio. 3 ills., 1,000 wds. Engineering and Cement World, May 15. 15 cts.

Value of Sewerage Systems. Evidence adduced by the New York State Board of Health to prove economic value of sewerage. 1 ill., 500 wds. Municipal Journal, May 18. 10 cts.

Oil Separator for Excluding Gasoline from Sewers. New York ordinance with respect to garages. 2 ills., 800 wds. Municipal Engineering, May. 30 cts.

Sanitation:

[illegible] of Camp Sherman Extra-[illegible] Chillicothe, Ohio. [illegible] water supply, milk, [illegible] restaurants, garbage, mosquitoes, etc. By B. E. Robinson, Surgeon U. S. Public Health Service. 2,500 wds. [illegible] Health Journal.

Water Supply and Sewerage of Recreation Camps at Lake Geneva. By W. S. Shields. 2 ills., 1,200 wds. Municipal Engineering, May. 30 cts.

Water Supply.

Reservoirs and Tanks:

Highland Park Reservoir. Constructing an unusually large reinforced concrete reservoir. 8 ills., 650 wds. Municipal Journal, May 4. 10 cts.

Accident to and Reconstruction of a Clay Puddled Dam. The Charmes dam of the Marne canal in France. Translated from an article by A. Dumas in Le Genie Civil. 1 ill., 1,300 wds. Engineering and Contracting, May 29. 15 cts.

Buenos Ayres Water System. Description of new elevated reservoirs at Caballito and Devoto. By Frederic C. Colman. 4 ills., 1,000 wds. Water and Water Engineering (London), April 20. 15 cts.

Steel Water Tower of 500,000 Gallons Capacity Erected at Stratford, Ontario. By A. S. L. Barnes. 3 ills., 1,500 wds. Canadian Engineer, May 30. 15 cts.

Pumping Stations:

Louisville Builds New Pumping Station on Huge Open-Well Caisson. First foundation of this type on Ohio river is successfully landed. Alternative design included steel truss bracing. Government gives priority for building engine. 11 ills., 2,800 wds. Engineering News-Record, May 9. 20 cts.

Electrification of Pumping Stations Saves Coal and Money. Philadelphia Water Bureau combines several small pumping, power and lighting loads at one of its smaller pumping and filtration plants and saves 4,000 tons of coal a year to help win war. By Harrison R. Cady. 2 ills., 1,400 wds. Engineering News-Record, May 9. 20 cts.

Municipal Dam at Fort Dodge. Used in connection with power house to create electric power for water works pumping plant. 8 ills., 1,500 wds. Municipal Journal, May 11. 10 cts.

Theoretical and Actual Delivery of Air Compressors. Theoretical discussion. By R. S. Lewis. 3,000 wds. Water and Water Engineering (London), Jan. 21. 15 cts.

Constructing and Testing:

Cost of Machine Trenching Under Difficult Conditions for Water Mains at Erie, Pennsylvania. Data concerning use of trenching machine. By E. W. Humphreys, Supt. of Water Works. 6 ills., 1,200 wds. Municipal Engineering, May. 30 cts.

Lowering a Twelve-Inch Water Main While Under Full Service Pressure. Description of method employed at Middletown, Conn. 500 wds. Engineering and Contracting, May 8. 15 cts.

Testing Newly Laid Mains by Air Pressure. From paper in the Surveyor of London. By R. O. Wynne-Roberts. 1,600 wds. Engineering and Contracting, May 8. 15 cts.

Pipe Testing Apparatus Saved Both Water and Time. Wood drum with metal head and hose connections used to test 42-inch reinforced concrete pipe at Seattle Water Works. By T. H. Carver. 2 ills., 800 wds. Engineering News-Record, May 9. 20 cts.

Operation:

Water Works Operation. Introduction to a series of articles dealing with maintenance and operation methods. 1,000 wds. Municipal Journal, May 4. 10 cts.

Water Works Operation. Importance of records of location, depth, etc. of [illegible] appurtenances. 1 ill., 3,000 wds. Municipal Journal, May 11. 10 cts.

Water Works Operation. Data concerning [illegible] that should be recorded, [illegible] them [illegible] 1,300 wds. Municipal Journal, May 1[illegible]. 10 cts.

[illegible] Works Operation. Statistics [illegible] information concerning [illegible] appliances used in [illegible] the freezing and thawing of [illegible] mains and services in about [illegible] Municipal Journal [illegible]

[illegible] Water Distribution [illegible] Organization [illegible] division [illegible] [illegible] building 3 ills., 1,800 wds. Engineering News-Record, May 9. 20 cts.

Keeping Ice from Ports of Water Intake. Paper before the American Water Works Association. By C. M. Daily. 2 ills., 800 wds. Engineering News-Record, May 9. 20 cts.

Thawing Services:

Electric Thawing of Services. Raises question of desirability of the practice. 400 wds. Municipal Journal, May 25. 10 cts.

Methods of Baltimore County Water and Electric Company for Thawing Water Services. Electricity used for about 700 services. 1,200 wds. Engineering and Contracting, May 8. 15 cts.

Rates and Metering:

Flat and Meter Rates Revised. Paper before the American Water Works Association. By E. E. Wall. 1,000 wds. Engineering News-Record, May 9. 20 cts.

Setting 25,000 Meters Cut Water Consumption at San Francisco. Two field crews placed ⅝ inch meters at average labor cost of $10.59; in paved sidewalks cost for 19,524 meters was $11.225 each, and in unpaved walks for 5.473 meters, $8.65 a piece. By George W. Pracy. 6 ills., 1,600 wds. Engineering News-Record, May 9. 20 cts.

Meters Help, But Are Not Sufficient to Control Waste. Unhampered officials holding strictly to right observance of water ordinances brings results. 2 ills., 1,600 wds. Engineering News-Record, May 9. 20 cts.

Free Water for Irrigation of Vacant Plot Gardens. Furnished last year by the Denver Union Water Co. 1,400 wds. Engineering and Contracting, May 8. 15 cts.

Water Waste Elimination in Oak Park, Illinois. Methods used and results obtained. By H. P. T. Matte, Engr. of Water Dept. 2 ills., 2,500 wds. American City, May. 40 cts.

Costly Waste in Chicago Water Works. Abstract of report of Bureau of Public Efficiency. 1,500 wds. Public Service, May. 30 cts.

Effect of War Conditions on Water Works. Resolutions of the executive committee of the American Water Works Association looking to raise in water rates. 900 wds. Municipal Journal, May 4. 10 cts.

After-the-War Prices on Water Works Construction. Maintains that cost of labor and material may go higher, but will not fall for some time. 2,000 wds. Municipal Journal, May 4. 10 cts.

Wartime Needs of Water Works. Rising costs and necessity of extending service. 900 wds. American City, May. 40 cts.

Purification:

Coal Pre-filter Prevents Sand Accretion in Final Rapid Water Filters. Rehabilitation of former private water works at Lawrence, Kan., involves increased supply from wells, complete purification plant for iron and hardness removal. 7 ills., 1,500 wds. Engineering News-Record, May 9. 20 cts.

Device for Feeding Hypochlorite. Description of one designed by the Water Department of Ottawa, Kansas. By W. O. Myers. 1 ill., 700 wds. Engineering and Contracting, May 8. 15 cts.

Selection of and Specifications for Alum for Filter Plants. From report of Ontario Board of Health. 1,300 wds. Engineering and Contracting. May 8. 15 cts.

Water Supply Standards and Their Improvement. General discussion of state laws and non-technical standards. By Wm. J. Orchard. 3,500 wds. Water and Gas Review, May. 25 cts.

Miscellaneous:

The American Water Works Association Convention. Description of the thirty-eighth annual convention at St. Louis. Changes in constitution, committee reports, etc. By Charles C. Brown. 2,200 wds. Municipal Journal, May 25. 10 cts.

Amendments to the Constitution of the A. W. W. A. Editorial discussion of proposition to change membership qualifications. 1,100 wds. Municipal Journal, May 4. 10 cts.

Watering and Unwatering an Industrial Plant, and Its Relation to the Public Water Supply. By W. F. Wilcox, Supt. Central Water Works. 3,000 wds. Municipal Engineering, May. 30 cts.

Water Works of Colorado Springs. [illegible] and thawing of mains and [illegible] source of supply and protection of water shed. 1 ill., 2,400 wds. Municipal Journal, May 25. 10 cts.

[illegible] of Water Mains. Power [illegible] of municipalities and [illegible] water companies to extend water mains, as defined by the courts. By John Simpson. 2,200 wds. Municipal Journal, May 4. 10 cts.

Water Supply at the Front in France. Engineering work for American forces centralized in specialists; horse important factor in quantity estimates. "Water points" must be provided. British and French water supply practice reviewed. By Robert K. Tomlin, Jr. 15 ills., 4,800 wds. Engineering News-Record, May 2. 20 cts.

Light and Power Plants.

New 20,000-Kilowatt Steam Plant at Waterloo. Citizens' Gas & Electric Company's new turbine station nearing completion. Other important changes and additions to the system give Iowa city modern service feature. 8 ills., 2,200 wds. Electrical Review, May 11. 30 cts.

Interconnected Power Systems of the South. Hydro-electric systems of independent companies operating in five states are connected into one system. 18 ills., 7,000 wds. Power, May 21. 10 cts.

Boiler Settings. First of a series on settings for various stokers under different boilers. By Chas. H. Bromley. 3 ills., 2,200 wds. Power, May 28. 10 cts.

Concrete Chimneys. Method of construction, monolithic type. By H. W. Young. 4 ills., 1,800 wds. Engineering and Cement World, May 1. 15 cts.

Concrete, Wood, and Steel Pole Line Costs Compared. Figures from actual experiences. 2 ills., 1,800 wds. Engineering and Cement World, May 15. 15 cts.

The Effect of Daylight Saving on Load. Data and curves showing how the daylight law affects typical central stations in the Middle West. 1 ill., 2,000 wds. Electrical World, May 11. 15 cts.

Tractor Saves Town from Darkness. Used to drive generator at Wilson, Kan., when engine fails; made a permanent installation. By Joseph H. Wiley. 2 ills., 1,200 wds. Electrical Review, May 4. 30 cts.

Street Cleaning and Refuse Disposal.

Snow Removal Methods and Equipment at Rochester, New York. Report of Bureau of Municipal Research. 1,600 wds. Engineering and Contracting, May 1. 15 cts.

Laconia Street Department Uses Four Snow Rollers. Six horses and three men cover 15 miles of road in nine hours at average cost of $1.40 a mile. By Charles A. French. 1 ill., 600 wds. Engineering News-Record, May 23. 20 cts.

Hamtramck's Incinerator. 12-ton plant for a Michigan village located in closely built up section. By Earle L. Waterman. 1 ill., 1,500 wds. Municipal Journal, May 11. 10 cts.

Turning Garbage Into Dollars. Advantages of hog raising, cost of plant, proper location and care needed. 1,200 wds. Municipal Journal, May 11. 10 cts.

Government and Finance.

Some Intangible Benefits of the City Manager Plan. By R. E. Bosshard. 2,000 wds. Pacific Municipalities, April. 30 cts.

Is the City Manager Plan Giving Satisfaction? Letters from officials and citizens of California cities having this form of government. 2,000 wds. Pacific Municipalities, April. 30 cts.

City Charters. Discussion of the various kinds used in the United States. By Wm. J. Locke. 3,000 wds. Pacific Municipalities, April. 30 cts.

Short-Lived Attempt to Unionize Baltimore City Departments. All grades of labor in water and other city departments delivered ultimatum; what city did when 2,000 laborers quit. By Walter E. Lee. 800 wds. Engineering News-Record, May 16. 20 cts.

Miscellaneous.

Interesting Underground Distributing System at Astoria, Oregon. Characteristics of sub-soil and subterranean construction such that gas, telephone and electric systems are conveniently routed; details of electrical distribution. 1 ill., 1,600 wds. Electrical Review, May 11. 30 cts.

Street Signs at Camp Custer. Description of guide boards used at this camp. By Chester W. Shafer. 4 ills., 400 wds. Municipal Journal, May 18. 10 cts.

Plate Girder Track Elevation Bridges in Philadelphia. Description of two recent bridges. By Albert M. Wolf. 3 ills., [illegible] wds. Engineering and Cement World, May 15. 15 cts.

(Continued on page 502.)

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

June 19-21.—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual meeting, Atlantic City, N. J.

June 19, 20.—LEAGUE OF TEXAS MUNICIPALITIES. Sixth annual convention, in cooperation with the Texas Commercial Executives' Association, San Antonio, Tex. Secretary, Edward T. Paxton, University of Texas, Austin, Tex.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual meeting, Northwestern University, Evanston, Ill.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City.

Oct. 2-4.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual meeting, Buffalo, N. Y. Secretary, Charles Carroll Brown, 304 E. Walnut St., Bloomington, Ill.

National Conference for Good City Government.

Practical and valuable results are expected to result from the work of the twenty-sixth National Conference for Good City Government, held in New York City June 5-7. In addition to its inspiration towards better coordination of local governments with the war work of the federal and state governments, it is hoped that the conference marked the beginning of a fundamental change in municipal accounting and reporting methods. There were essentially three conferences: The Conference for Good City Government, National Conference on War Economy and Governmental Research Conference. The cooperating bodies were the National Municipal League, the Governmental Research Conference, Association of State Leagues of Municipalities, Academy of Political Science, New York Bureau of Municipal Research and the Civic Secretaries' Conference.

The Governmental Research Conference began its sessions at the Greenwich House Wednesday morning by dividing for three round table discussions: "Municipal Accounting and Finance," led by R. J. Patterson of Philadelphia; "Street Cleaning," led by J. W. Routh of Rochester, N. Y., and "Public Health," by Carl McCombs of New York City. The first discussion brought out some very interesting statements on the problems of segregated budgets; lump sum appropriations; control of expenditures; transfers: central purchasing, etc. After spirited discussion by Herbert R. Sands of New York City, Col. LeRoy Hodges of Petersburg, Va., L. A. James of Ohio, Frederick P. Gruenberg of Philadelphia, and city manager H. G. Otis of Auburn, Me., at the suggestion of leader Patterson, a committee was appointed to begin active work on the whole subject of municipal accounting with a view to thorough and basic reorganization of current practice. This committee, consisting of Messrs. James of Ohio, Sands of New York, Lawton of Rochester, Steffens of Detroit, and Patterson of Philadelphia, worked during and between the other sessions and agreed on a new approach to the problem. Governmental accounting methods are to be harmonized with those of private business and all nomenclature and classification simplified so as to be intelligible not only to accountants, but to the interested general public. The members discussing street cleaning took up the questions of curtailing and restriction because of war conditions; types of organization, and contract vs. day labor, those taking part in the discussion including leader Routh, W. A. Bassett of New York, Sedley H. Phinney of Philadelphia and city commissioner C. C. Nesten of Salt Lake City. The subjects of typhoid fever prevention; the control of diphtheria; the district health plan; borough autonomy, and birth registration were taken up in the discussion on public health.

At the same time the National Municipal League held its meeting. Clinton Rogers Woodruff, Philadelphia, secretary, gave his annual review, under the title, "Preparedness for War and Peace." President Lawson Purdy, New York City, delivered the annual address on the subject, "State and Local Governments in the Light of War Necessities." W. L. Ransom, counsel for the Public Service Commission for the First District of New York, spoke on "The Municipality and the Public Utility in War Time." Reports from the following committees were presented: "Survey Committee," Mayo Fesler; "Franchise Committee," Dr. Delos F. Wilcox; "County Government Committee," Otho G. Cartwright.

At noon a joint luncheon was held with the other bodies, at which Lucius E. Wilson acted as toastmaster and at which the following entered into a discussion of "The War-Time Work of Civic Organizations": C. H. Anderson, secretary of the League of New Jersey Municipalities; Harrison Gray Otis, city manager of Auburn, Me.; L. D. Upson, director of the Detroit Bureau of Governmental Research; Miss H. Marie Dermitt, secretary of the Civic League of Allegheny County; W. J. Donald, secretary, Chamber of Commerce, Niagara Falls, N. Y.; Leroy E. Snyder, director, Rochester Bureau of Municipal Research.

On Wednesday afternoon a joint meeting was held, which considered the timely and urgent question, "How Shall We Head Off Bolshevikism in American Cities?" This was defined by the program committee as "dangerous unrest—a tendency to disregard the established political mechanism in efforts to secure results by unlawful short-cuts." The committee asked: "What things should we do to set our house in order so as to make government so responsive, effective and obedient that the shortest and easiest way to get social and economic progress will be by way of lawful and orderly governmental action? A municipal government that is tied hand and foot with red tape and complex charter limitations in the hands of a tight political ring which capital can easily control, gives considerable excuse for the kind of impatience that wants to kick the whole fabric of society into the discard." City manager Thomas H. Reed of San Jose, Cal., advocated the city manager plan of government to combat American Bolshevist tendencies, this plan eliminating lost motion in the mechanism of government, providing a single responsive head and "bringing the people to the government." Prof. Augustus R. Hatton, Western Reserve University, said that Bolshevikism "could not be exorcised by damming" and advocated proportional representation as a means of quieting discontent by providing self-expression through organized representation in the government; the recent election in Kalamazoo, Mich., being cited in detail as an example. P. W. Wilson, formerly Member of Parliament, London, England, said it was necessary to remedy existing unrighteousness rather than to head off unrest. He said that with the extensive and growing government ownership in his country, it was rapidly becoming a socialist state. He asserted that education is useless if old social conditions are allowed to remain; he declared that "the state is on trial," and urged that government be brought into close relation with human need. Frank Dilnot, also of London, and president of the Association of Foreign Press Correspondents in U. S., spoke of the "reconstruction program" of the English trade unions; he said that Bolshevikism was a "mental twist" with an aversion against authority and advocated the teaching of English and patriotism to foreigners, and civics to the young, and also better representation for the masses of the people. A. Leo Weil, president of the Voters' League of Pittsburgh, said that the greatest opposition to the work of the National Municipal League and similar organizations had come from "the interests" and warned that with labor becoming conscious of its power, the country could never return to pre-war conditions. He said that the social consciousness of the people must be aroused and suggested that in each community a committee of experts be appointed to plan for the city all improvements demanded and to work with all elements of the population. George Everson, executive secretary, Committee on Criminal Courts, Charity Organization Society of New York, discussed the relation of the courts to the foreign population, and Richard S. Childs, secretary, Committee on Indus-

(*Continued on page 501.*)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

VEHICLE DIRECTION INDICATOR.

Lehman Device for Accident Prevention at Street Intersections.

The Lehman vehicle direction indicator consists essentially of a lighted post, containing a bell, so constructed that if accidentally driven into by a vehicle the car can pass over it and the post will rebound to its normal position. Traffic posts have sometimes proved sources of danger and many have been damaged by drivers turning to avoid other accident. The Lehman post serves a three-fold purpose of directing traffic, warning vehicles of the approach of fire apparatus and also calling the police patrolmen on duty. The economy of the post over a policeman stationed at the corner is obvious.

The post is substantially made and the principal parts are built to last a lifetime. Such parts as may have to be renewed following accident are easily procured and inexpensive. The post is painted in bright colors and is provided with an electric or gas light. This is covered by a red globe and can be lit from the central station for service during the night, foggy or stormy weather. By means of a highly tempered, heavy coil spring, the post rights itself in perfect condition in normal location. It is, therefore, possible to use it between double street car tracks.

The bell may be rung from the central fire station as soon as apparatus leaves it until the post is passed. Drivers are warned not to get in front of the approaching fire trucks. The alarm can be heard more than a block away. The bell may also be used as a call for policemen from the station when the station officer wishes the patrolmen to call him on the telephone.

The post is also used to serve as a safety zone for pedestrians.

The illustrations on page 501 show the vertical and horizontal positions of the post. It is made by J. H. Lehman, Elkhart, Ind.

INDUSTRIAL NEWS

Cast Iron Pipe.—The new government prices announced recently are now being quoted and will probably remain effective. Quotations: Chicago: 4-inch, $63.35; 6-inch and larger, $60.35; Class A $1 extra. Birmingham: 4-inch, $58; 6-inch and larger, $55; Class A $1 extra. New York: 4-inch, $64.35; 6-inch and larger, $61.35; Class A $1 extra.

The Sullivan Machinery Company, 122 South Michigan avenue, Chicago, Ill., announces the establishment of a branch office at Washington, D. C., at Room 210, Union Trust Building, corner 15th and H streets. Ralph T. Stone, associated with the New York office of this company, will now be in charge of its local interests in Washington. The establishment of this Washington office will, it is hoped, be of convenience to clients and customers in Washington and vicinity.

Mack Trucks for "Over There."

The accompanying illustration shows a view of a fleet of more than two hundred Mack war trucks "in battle array," lined up for inspection before shipment to France. These trucks and several thousand others are to be used in "the greatest construction job on earth" by the U. S. Engineers.

Conservation of Tin by Electrical Manufacturers.—The general war service committee of the Electrical Manufacturing Industry, with headquarters at 50 Church street, New York City, in a recent bulletin calls the attention of electrical manufacturers to the necessity of economizing in the use of tin in the industry. It recommends the use of other metals whenever possible. The bulletin says in part: "The United States government has assumed control of the importation and distribution of tin in the United States. Demand is made that the use of tin cease for all non-essential purposes and be reduced elsewhere to the minimum consistent with the production of material and apparatus which will function safely and satisfactorily. If electrical manufacturers are to obtain their supply of tin, it will be necessary for every one to economize to the fullest extent possible. The uses of tin are for three general purposes, viz., babbitt metal, alloy castings, and tinning and soldering, in which tin consumption can be reduced by:

1. (a) The use of lead-base babbitt metal in substitution for tin-base babbitt metal. (b) The reduction of tin content in a tin-base babbitt where the use of the latter is necessary. (c) The use of the thinnest section of babbitt metal consistent with a satisfactory bearing. Babbitt is frequently wasted in thick linings. Layers of babbitt metal not exceeding one-sixteenth inch thickness will make a very satisfactory lining if sweated to a proper backing metal.

2. The percentage of tin in most alloy castings is unnecessarily high. It is common practice in brass foundries to look on tin as the cure for most troubles in producing brass or bronze castings. Even a 1 per cent reduction throughout the country would result in an enormous saving in the total consumption.

3. (a) Pure tin solder is frequently used where mixtures of lead and tin in varying proportions may safely be sub-

FLEET OF MACK TRUCKS WAITING TO BE SHIPPED TO FRANCE stituted. (b) Half tin to half lead solder is very commonly used, whereas a mixture of 55 to 60 per cent lead is often equally satisfactory. In many cases lead may be safely increased to 70 per cent with 30 per cent tin. (c) It is common practice to dip ends of leads and other parts to be soldered into molten tin in preference to common solder mixtures because mixtures when kept melted for a long time tend to separate into layers of different composition. The eutectic alloy, 63 per cent tin to 37 per cent lead, which melts at 180° C., will not separate as long as this proportion is fairly well maintained. Use such a bath when soldering with lead-tin alloys and use tin only when parts must be soldered with pure tin.

The foregoing suggestions only cover a few means of reducing the consumption of tin to the necessary minimum. Other suggestions which you can furnish your General War Service Committee will be welcomed.

NEWS OF THE SOCIETIES

(*Continued from page* 499.)

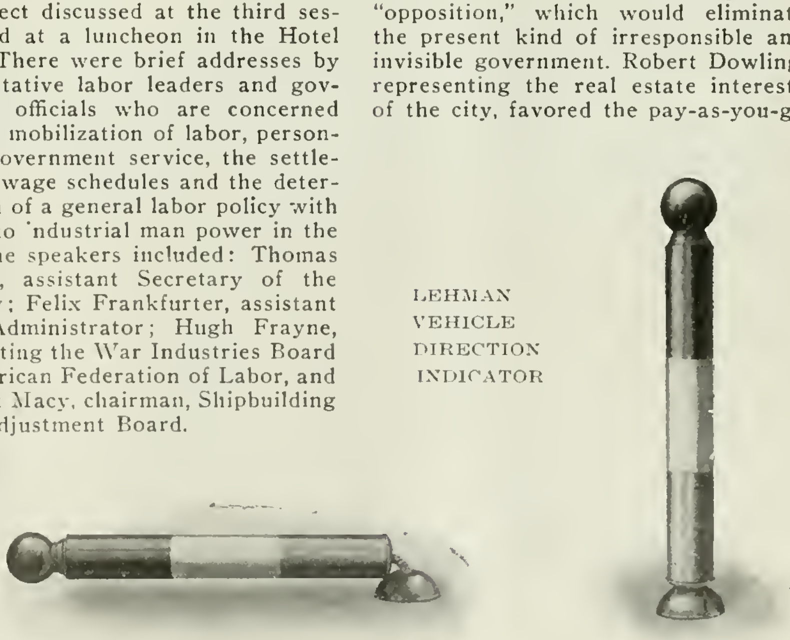
trial Housing, described the methods of providing adequate housing for workers in war industries. R. P. Farley, formerly executive director, Citizens' League, Winnipeg, Man., and now of Baltimore, said that Bolshevikism was the logical result of corruption and industrial tyranny and advocated independent, representative committees in each community to investigate conditions and make recommendations for improvements.

The first session of the National Conference on War Economy, which was particularly well attended, was held at Columbia University, and dealt with "Executive Leadership in a Democracy." R. Fulton Cutting, chairman, Board of Trustees, New York Bureau of Municipal Research, presided. "Recent Growth of Executive Leadership" was the subject of Frederick A. Cleveland, Industrial Service and Equipment Company, Boston, who urged that executives in government be given more power and more responsibility and that an effective "opposition" should be developed and recognized. Governor Frank O. Lowden, of Illinois, in discussing "Executive Responsibility for War Economy," described the fight for the "Civil Administrative Code" in his state, its efficiency and its effective distribution of executive power and responsibility. Richard S. Childs urged that executive leadership in legislation should not be neglected and suggested the formation of legislative cabinets to carry through programs of legislation. "The Illinois Civil Administrative Code" was read by title by Charles E. Woodward, of the Illinois Bar. Col. LeRoy Hodges described conditions in Virginia and urged great citizen cooperation with the war work of the nation.

The second session was held Thursday morning in the Belvedere room of the Hotel Astor, Mortimer L. Schiff, of Kuhn, Loeb & Company, presiding. Comptroller Charles L. Craig of New York City spoke on "The-Pay-As-You-Go Policy in New York City," ascribing the urgent need for its abolition to the burdensome taxation caused by paying for non-revenue-producing improvements out of current taxation. Paul M. Warburg, vice-governor of the Federal Reserve Board, described the work of the Capital Issues Committee and the War Finance Corporation and the control of unnecessary expenditures through the regulation of raw materials. He warned against impairment of the credit of the public utility corporations and urged that state and municipal governments do their utmost in helping public service corporations waive contractual obligations which would be burdensome at the present time. In discussing the general subject, Howard L. McBain, professor of municipal administration in Columbia University, said that what the cities need is "not coercion, but a program," and that such a program could be supplied by the Capital Issues Committee, which could be developed into a constructive agency. He said that general talk of necessary and unnecessary improvements was valueless and that the federal government should set up a far-reaching and complete supervision over city budgets. He urged that the cities be used in the demobilization of our troops and in the reconstruction developments after the war. He advocated the immediate beginning of active work on a reconstruction program for cities which should provide for large improvements to help avoid unemployment and distress of returned troops and war industries workers. Arthur M. Anderson, of J. P. Morgan & Company, defended the pay-as-you-go policy as being the bravest thing the city has done and attributed its difficulties to war conditions. He described the financing of New York City and especially the critical period at the beginning of the European war. Benjamin C. Marsh, representing the Farmers' War Finance Committee, advocated "equality of financial sacrifice" in paying for the war by the 100 per cent taxation of all annual incomes in excess of $50,000.

"The Government As Employer" was the subject discussed at the third session held at a luncheon in the Hotel Astor. There were brief addresses by representative labor leaders and government officials who are concerned with the mobilization of labor, personnel of government service, the settlement of wage schedules and the determination of a general labor policy with respect to industrial man power in the war. The speakers included: Thomas B. Love, assistant Secretary of the Treasury; Felix Frankfurter, assistant Labor Administrator; Hugh Frayne, representing the War Industries Board and American Federation of Labor, and V. Everit Macy, chairman, Shipbuilding Labor Adjustment Board.

The afternoon session was presided over by Victor Morawetz, and took up the subject of "The New Era in Budgets." W. F. Willoughby, director of the Institute for Government Research at Washington, speaking on "The Budget as an Instrument of Political Reform," emphasized the value of the executive budget. "The New Jersey Budget Law" was fully and interestingly described by Arthur N. Pierson, majority leader, New Jersey Assembly, and chairman of the Commission for the Survey of Municipal Financing of New Jersey. He showed how the lack of training and ability in legislators and the abuses of the supplemental appropriation resulted in failure and extravagance in legislative budgets and how intelligent budget preparation brings the administration into contact with state institutions and needs. He described the effective work of a permanent, continuous budget committee composed of experts. Governor Frank O. Lowden, of Illinois, in describing "Budget Reorganization in Illinois," explained how the state department of finance is responsible for uniform accounting and reporting, auditing, approval and investigation, and also for the preparation of the budget and research work for the other departments. He showed how the new budget procedure in his state made for economy. "The First State Executive Budget" was described in detail by Governor Emerson C. Harrington, of Maryland, who spoke of the work of the budget commission and the effect of the new system. A paper on "The Development of the Budget in Illinois" was read by title by the director of finance, Omar H. Wright. In the discussion, Frederick A. Cleveland presented the interesting view that budget making should be more like a court procedure and that more attention be paid to the interests of the public. He suggested that this could be accomplished by a well organized "opposition," which would eliminate the present kind of irresponsible and invisible government. Robert Dowling, representing the real estate interests of the city, favored the pay-as-you-go



LEHMAN
VEHICLE
DIRECTION
INDICATOR

[illegible] suspension [illegible] advocated [illegible] real estate [illegible] property. Frank J. [illegible], president of Johns Hopkins University, brought out the principles which were at the basis of the work of his Maryland budget commission.

A joint dinner conference was held at the City Club Thursday evening at which were discussed "New Duties of City and State Governments in War Times." A number of members of the various organizations spoke on the subject.

On Friday the conferences of the research agency representatives were resumed at the Greenwich House. Following a business meeting, at which Otto Kirchner of Detroit presided, the present officers were re-elected for the coming year. These are: President, Otto Kirchner, president, Detroit Bureau of Governmental Research; vice-president, Bruce Cornwall, president, San Francisco Bureau of Governmental Research; secretary-treasurer, Leroy E. Snyder, director, Rochester Bureau of Municipal Research; assistant secretary, R. T. Crane, professor of political science, University of Michigan; trustees, Frank L. Olson, director, Bureau of Municipal Research of the Minneapolis Civic and Commerce Association, and R. P. Farley of Baltimore; librarian, Gertrude E. Woodard, Bureau of Government, Ann Arbor, Mich. The organization's library and clearing house service was then discussed. Much interest centered in the subject of the type of organizations to which membership should be opened. Horace L. Brittain of Toronto then led a round table discussion of "Bureau Management." This proved to be one of the features of the conference. It began with the presentation of a number of views on the delicate subject of relations between trustees and staff and it seemed to be the general opinion that while cooperation of trustees' committees was very desirable and could be made of real value, the technical staff should be made responsible for the work of the bureau. Then director Frederick P. Gruenberg of the Philadelphia bureau urged that the word "expert" be eliminated from discussions as being offensive to the public and replaced by the word "specialist." He also advocated that women be encouraged to become trustees of research bureaus. Following him Herbert R. Sands of the New York bureau suggested the appointment of representatives of the engineering and legal professions to the boards of trustees. Charles A. Beard, director of the New York bureau, then made a most inspiring plea for a new viewpoint in research work. He said that most of the labor was useless as the human needs of the people were not considered. He showed how the half million dollars spent on salary standardization on New York's civil service had been practically wasted because the workers had not been understood. He spoke of the failure of scientific management in factories and of the bitter aversion of the people to "investigation" methods of charity organizations. He urged that labor be represented on the board of trustees of research bureaus and that the basic problem of interesting the people in good government be given adequate consideration.

Following a luncheon tendered by the New York bureau to the conference, discussion was resumed. R. P. Farley acted as chairman and the keynote of the remarks was really the ideas presented by Dr. Beard. After a brief consideration of university research questions, a discussion of "Public Employment" was led by D. C. Sowers. Prof. A. R. Hatton of Western Reserve University and Paul Eliel, assistant manager of San Jose, took up a number of phases of civil service improvement. The committee on municipal accounting announced that its work was making rapid progress and that preliminary reports would be issued very shortly.

PERSONALS

Fenkel, George H., has resigned as commissioner of public works of Detroit, Mich. He is now civil engineer to the Water-Works Bureau.

Smith, C. E., city consulting engineer, St. Louis, Mo., has received a commission as major in the construction division of the army.

Kemmler, E. A., has been appointed engineer in the division of highways, Akron, O. Mr. Kemmler was graduated from the Ohio State University in 1888, and from 1891 to 1895 he was assistant professor of civil engineering at the university. From 1895 to 1908 he was assistant engineer and later resident engineer with the city of Columbus, O. He was then supervising city engineer, Muskogee, Okla.; assistant engineer, Akron, and later chief engineer, Coventry Land & Improvement Co., Akron, Ohio.

MUNICIPAL INDEX

(*Continued from page 498.*)

Some Features of New York City's Rapid Transit System. General Description of elevated, surface and subway lines. By Robert Ridgeway. 10 ills., 15,000 wds. Journal Boston Society of Civil Engineers, May. 60 cts.

Elevated Roadway Proposed for New York City. Suggested by Deputy Police Commissioner Harris. 1 ill., 700 wds. Engineering and Cement World, May 1. 15 cts.

Drilling Frozen Ground With Hot Water. Method of sinking holes through earth and boulders. 1 ill., 600 wds. By Henry M. Payne, Canadian Engineer, May 2. 15 cts.

Organic Impurities in Sand. Description of a simple way of detecting them. 800 wds. Engineering and Contracting, May 1. 15 cts.

Motor Trucks Cheaper Than Teams on Hauling Gravel. Distributed costs show a saving of about 20 cents per yard-mile; machines particularly good on harder work. By F. P. Scott, 1 ill., 900 wds. Engineering News-Record, May 16. 20 cts.

Ethics of Contracting and the Stabilizing of Profits. By F. W. Lord. 7,000 wds. Bulletin of the General Contractors' Association, May. 30 cts.

Large Outdoor Swimming Pool Built in Circular Form. Bottom increasing in depth toward center is paved with reinforced concrete; water pumped from river and filtered. By C. E. Bliss. 2 ills., 1,200 wds. Engineering News-Record, May 23. 20 cts.

Conflagration Stopped by Fire-Resistant Buildings. Concrete warehouses in path of flames hardly harmed by fierce fire in Kansas City wholesale district. 1 ill., 700 wds. Engineering News-Record, May 16. 20 cts.

Growth of Return Loads Bureaus Requires a Government Director. 21 bureaus now operating in four states. 2 ills., 4,000 wds. Commercial Vehicle, May 1. 25 cts.

Return Load Bureaus to Save Waste in Transportation. From Bulletin of Highways Transport Committee. 2,400 [illegible] Good Roads, May 4. 15 cts.

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

A SEWER SYSTEM is to be built by Westbrook Minn., from plans to be prepared by the consulting engineering firm of Rose & Harris.

WATERWORKS IMPROVEMENTS are to be built by Fairfax, S. D. The consulting firm of the Dakota Engineering Company has prepared plans for the work.

Ecorse, Mich., is considering the construction of a SEWER SYSTEM. The consulting engineer for the proposed improvement is Russel A. Murdoch.

[illegible] IMPROVEMENTS are to be made by Warrenton Ore., to cost about 20000. The consulting engineer for the work is A. Bartlett.

Improvements are to be made to the WATERWORKS of Versailles, Ky. [illegible] machinery being installed and [illegible] and pumping station built. The consulting engineer is Charles E. [illegible]

Jasper County, Colfax, Ia., is to build a steel highway BRIDGE. Plans for the structure have been prepared by the Marsh Engineering Company.

Erving, Mass., is to make WATERWORKS improvements, including a concrete reservoir and pipe. The engineer for the work is Allen Haywood.

Miami, Okla., is to make PAVING IMPROVEMENTS on a number of streets. Plans for the work were prepared by the Hughes Engineering Company.

A municipal WATERWORKS SYSTEM and LIGHTING PLANT are to be built by Miller, S. D. The consulting engineer for the improvements is Earl D. Jackson.

Rock Island, Ill., is to develop a PARK, including shelter house, pool, comfort station, etc. Preliminary plans for the improvement have been completed by the landscape architects, the American Park Builders.

Municipal Journal

Volume XLIV. NEW YORK, JUNE 22, 1918 No. 25

XENIA'S SEWAGE TREATMENT PLANT

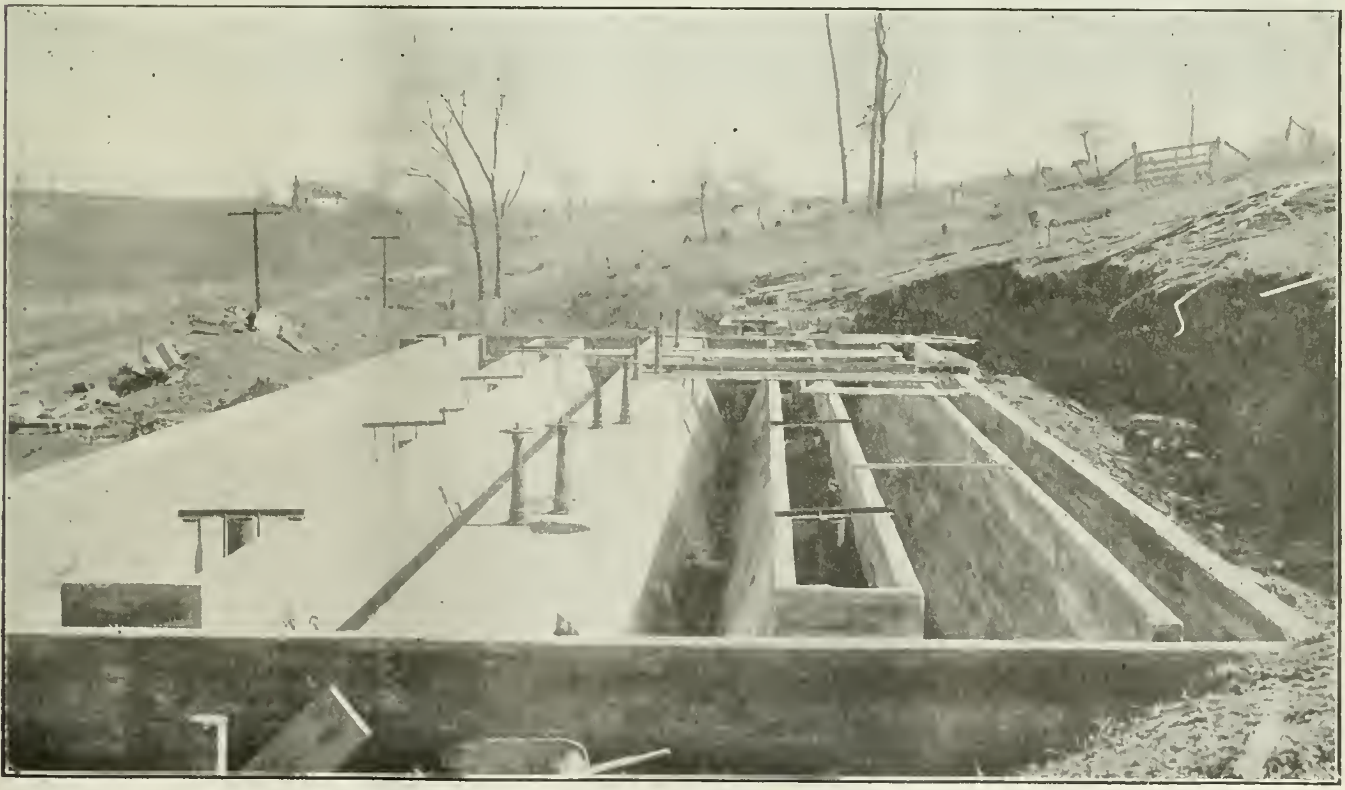
Two-Story Sedimentation Tanks and Filter Beds for Small Ohio City—Old Plant Too Small and Inefficiently Operated—Amount of Sewage About Half the Minimum Flow of Diluting Stream.

Xenia, with a population of about 9,000, is the county seat of Greene county, Ohio, a rich agricultural country with a rather sparse population—71 per square mile as compared with an average of 117 for the entire state. The business of the city is dependent largely upon the rural districts for support, although there is some manufacturing, chiefly shoes, cordage, canned goods, paper and machinery.

About fifteen years ago a fairly complete system of separate sewers was constructed, including a sewage treatment plant that consisted of two small, shallow septic tanks with a joint capacity of 19,000 gallons and about one acre of sand filters in four units. It is believed that, if well constructed, this plant could have treated 125,000 gallons per day satisfactorily, but owing to its poor construction the capacity was probably not more than 100,000 gallons per day. The total average flow of sewage, however, was probably at least 300,000 gallons a day, as at 9 A. M., December 22, 1917, there was measured a rate of flow of 350,000 gallons a day, and at 10 A. M., April 13, 1918, the flow was at the rate of 490,000 gallons, and the population has increased less than ten per cent since the plant was built. In addition to the totally inadequate size of the plant, the sand used in the filter beds was of poor quality. Moreover, the plant had never been maintained properly, but had been entirely neglected by the city authorities.

As a result of this condition the plant became a nuisance and was entirely abandoned about ten years ago, and the sewage was discharged untreated into Shawnee creek. Shawnee creek has a drainage area of about 12½ square miles, a maximum flow of about 50 second-feet and a minimum flow of about one second-foot. The pollution of the creek caused by the sewage has given trouble for several years, and a new plant has been constructed about half a mile down the creek from the old one and about 8,000 feet from Court House square, which was put into service on April 9th of this year.

The new plant consists of two Imhoff settling tanks, a sludge bed, a reinforced concrete control chamber and



TWO-STORY SETTLING TANKS OF XENIA SEWAGE TREATMENT PLANT.

four acres of sand filters. It was designed to treat a flow of domestic and manufacturing wastes aggregating 500,000 gallons in 24 hours, with provision for enlarging the capacity 50 to 100 per cent in the remote future. As the city has grown in population less than one per cent per annum for the past twenty years, there is little likelihood that its present capacity will be exceeded for many years to come.

No pumping is required, but there is sufficient fall to permit the entire plant to operate by gravity. The two-story settling tanks have a depth from flow-line to bottom of sludge chamber of *27.75* feet. The upper or settling chambers have a total capacity of 8,000 cubic feet, equivalent to a three-hour detention period when treating 500,000 gallons per day, or a two-hour period when treating 750,000 gallons per day. The lower or digestion chambers have a storage capacity of about 15,000 cubic feet. Before entering the tanks the sewage passes through bar screens formed of ¼-in. by 1-in. bars spaced 1 in. apart. Provision is made for measuring the sewage by a weir as it enters the tanks.

Sludge beds are provided, in three units, with an area giving 0.43 square feet of bed per capita of population, on the assumption that the volume of sludge will approximate .0035 cu. ft. per capita per day.

The control or dosing chamber has a capacity of 11,000 cubic feet, with a flow line 7½ feet above the sand filter beds. It is calculated that each dose of sewage will require about thirty-five minutes for the 14-inch siphon to discharge, and that each bed will be flooded twice each day. The sand used as filtering material was specified to consist of 24 inches of sand, of which 80 per cent should pass a No. 20 sieve and be retained on a No. 40, 6 inches of gravel of ⅛ inch to 1 inch diameter, and 6 inches of ¾-inch to 2-inch stone. In making the plans, it was proposed to use galvanized iron for the carriers, but on account of the high war prices of 13 cts. per pound a change was made to vitrified pipe resting on reinforced concrete slabs.

The designing and constructing engineer was W. J. Sherman, of Toledo, Ohio, and Frank Guthrie was resident engineer. The contractor was R. T. Bailey, of Dayton, Ohio. The contract prices were 40 cts. per cubic yard for excavation of filter beds and $1.00 per cubic yard for excavation for the tanks; filter sand and gravel, 80 cts. per cubic yard; concrete in tanks, $15 per cubic yard, concrete in control chamber, $8 per cubic yard; reinforcing steel, $110 per ton; 14-inch siphons in place, $550 each. In extending the trunk line, 20-inch sewer pipe in place cost 85 cts. per foot, and trenching cost from 30 cts. per foot for 6-ft. depth to $7.90 for 32-ft. depth; manholes, $40 each. The cost of the outfall sewer was $8,346; of the settling tanks, $19,102; of the sludge bed, $742; of the control house, $4,883, and of the sand filters, $24,627. Lands and right of way cost $2,970; printing and advertising, $262, and contingencies and engineering, $5,028; a total cost of $65,960.

FILTER BEDS OF XENIA SEWAGE TREATMENT PLANT.

WATER CONSUMPTION IN ST. LOUIS.

Water Commissioner Wall Urges Metering to Replace House-to-House Inspection for Reducing Waste—Saving in Coal and Money Possible.

In St. Louis, Mo., a systematic house-to-house inspection for leaks and waste of water is kept up continuously, and by this means the consumption is kept down to an average of 133 gallons per capita per day—less than at Buffalo and Chicago or even at Philadelphia. But this rate is not considered satisfactory by Edward E. Wall, water commissioner, who believes that 90 gallons would be ample allowance for domestic, commercial and public uses, and that a 20 per cent additional allowance for extravagance and waste, or 107 gallons, is attainable and reasonable.

This figure of 107 gallons is obtained by taking 40 gallons for domestic use; 12 for streets, public building and parks and other public uses; 45 for commercial use, and 10 for underground losses, slip of meters, and water stolen through unrecorded connections and misrepresentations.

In May, 1912, Mr. Wall measured the consumption in *37* St. Louis residences containing *212* occupants and found an average consumption of 57 gallons per capita, with a daily minimum of 7 and maximum of 202. The next month the average was 54, minimum 6 and maximum 212. Another district containing 279 residences occupied by the poorer classes of people and containing 1,820 occupants gave an average per capita consumption of 9.82 gallons, that was reduced to 8.58 by locating and repairing leaks. In these 279 houses, however, there were only 86 baths and 109 toilets. Similar sections in other parts of the city gave 6½ to 13 gallons per capita as averages. An investigation made some years ago of consumption in a residence of ten rooms occupied by six persons showed that on a certain day 52 gallons were used for bathing, 2.6 for drinking (eight glasses of water for each occupant), 27.4 for cooking, 16.0 for scrubbing, 29.0 in the lavatories and 51.0 in the toilets. This gave a total of 178 gallons, or a little less than 30 per capita. Mr. Wall therefore thinks an average of 40 gallons should be ample for domestic use.

The difference between 133 gallons and 107 gallons, or 26 gallons, he considers wanton waste for which there is no justification whatever. This was equivalent to twenty million gallons daily in 1917, and the cost of pumping, purifying and re-pumping this amount of water was not less than $40 per million gallons, or $800 a day, for operation and maintenance charges alone—$292,000 for the year.

Much of this waste was spasmodic rather than continuous. During the 43 days of the cold spell from December 28th to February 8th last winter, the minimum consumption was 110,600,000 gallons, the maximum was 156,500,000 gallons, and the average 126,400,000; while the average during November and March was 92,000,000 gallons, indicating that 34,400,000 gallons a day was due to the low temperature—presumably letting faucets run to prevent freezing.

The coal burned per million gallons of water pumped at St. Louis (actual weights taken in the boiler rooms) averaged 3,800 pounds; therefore more than 65 tons of coal were consumed each day of the 43 in pumping this wasted water, a total of 2,800 tons, when coal deliveries were being restricted to the bare necessities of preferred classes of consumers.

If the consumption could be reduced to 107 gallons, it is estimated that the present works would supply the increasing population of the city until 1936. Among the restrictive measures that Mr. Wall would have immediately authorized may be mentioned the prohibition of lawn-sprinkling or washing sidewalks, except between certain hours in the mornings and evenings; forbidding the use of automatic devices for sprinkling lawns or gardens, except where premises are metered; prohibiting the use of water motor washing machines, and, in fact, the use of water motors in general; the enforcement of strict regulations for the conservation of the free water used by and under the orders of city departments other than the water department.

The enforcing of these regulations would require constant vigilance, and there would still remain the elimination of leaks and waste inside the house. The method of house-to-house inspection for effecting this depends for its efficiency on the frequency of individual inspections, but Mr. Wall does not believe that it can ever be completely effective. "It is not in human nature," said he recently, "for inspectors to continually perform duties more or less unpleasant,—and to perpetually make visits that are usually unwelcome, yet all the time maintain a high standard of efficiency. It does not generally require many months for an inspector to become somewhat weary of going over the same ground,—to relax his vigilance and to make his visits somewhat perfunctory. We could hardly expect to find, as a rule, for the positions of inspectors at salaries of $75.00 per month each, men with a keen sense of humor, who would so enjoy the experience of coming in daily contact with many various and sundry specimens of humanity, that the employment would become a pleasure. People do not like to have their houses inspected. In general, they feel that in paying for a water license, they have certainly purchased a right to an extravagant use of water, —if not an absolute privilege to waste it if they desire to do so. In summer they waste many times more water in lawn-sprinkling than is necessary for the growth of the grass and flowers. In extremely cold weather they let the water run to prevent pipes from freezing. No doubt it is more economical for the consumer to waste water than to pay plumber's bills, so long as his premises are assessed at flat rates. The claim may also be set up that the loss to the community, as a whole, would be less from the general wasting of water, than the total expense of repairing all the bursted piping that would result if the water was not allowed to run and wholesale freezing resulted. This claim might be substantiated if the matter ended with the mere comparsion of the value of the water wasted and the probable plumber's bills. Unfortunately the value of the water lost is but a small part of the damage done to the public.

"The demoralizing effect of approving waste under certain conditions should be readily apparent, and its consequences could not help but be of additional assistance in forwarding the day on which the water supply would be unequal to the demand.

"The only effectual and economical method of reducing water waste and leakage to a minimum is through the general installation of meters. The results attained will be permanent and the meter will automatically act as an inspector perpetually on the job."

To thoroughly meter St. Louis would require about 100,000 meters of ¾-inch size or smaller, in addition to those now in service. All the larger connections are already metered. It is suggested by Mr. Wall that these be installed at the rate of 20,000 a year for five years. He estimates the cost of this at present prices to average $17.50 per meter, the 100,000 costing as follows

80,000 ⅝-inch meters at $10 each............	$800,000
20,000 ¾-inch meters at $15 each............	300,000
70,000 sidewalk boxes installed at $8 each.....	560,000
30,000 installations in basements at $3 each....	90,000
Total cost of 100,000 meters installed........	$1,750,000

Such metering should reduce the average daily consumption to 92 million gallons in 1924, instead of the 116 million which it is estimated that it will probably be if the present policy of flat rates is continued. With metering the present water works can supply the city until 1936 and possibly until 1940 if its growth continues normal. Otherwise new works must be provided within ten years.

With an initial investment of $1,750,000 and an annual cost after 1924 of not more than $250,000 to cover depreciation, renewals and reading meters, the city will save annually the cost of 7,000 million gallons of water, or at least $280,000. With the advance in costs of materials and labor, the operation and maintenance of the water works will cost more than the collections on the present basis. Either the revenue must be increased or the expenses decreased, and reducing waste seems to be the only way to decrease expenses.

"With the waste of water eliminated as far as practicable through the general installation of meters," says Mr. Wall, "there would be some hope of establishing a schedule of rates that would tend to institute just and fair dealing between the city and the consumer,—a condition which is impossible even to approach under the present system of flat, special and meter rates.

"Setting aside for the moment the immoral and unpatriotic phase of the habit of wasting water, the community must sooner or later face the consequences of the continuance of the practice. It is not too early now to start on measures for curtailing waste, and for the general installation of meters to be completed in five years. Every year that action on the matter is delayed brings the crisis nearer, and when the situation becomes so acute that further delay is impossible, remedial measures will be all the more costly."

PIGS IN THE PARKS.

The London County Council is considering the subject of keeping pigs in the parks. If the scheme fructifies, local authorities in the provinces may find it expedient—and profitable—to turn a portion of their public parks and open spaces into municipal piggeries.—*Municipal Engineering and the Sanitary Record* (London).

RETURN LOADS BUREAUS.

The return loads bureau idea is spreading in the east and it was reported a few days ago that 32 stations had been established. These stations are as follows:

Connecticut: Chambers of Commerce of Bridgeport, Bristol, Danbury, Hartford, Meriden, New Britain, and Norwich; War Bureau of Danbury, Greenwich, Manchester, Middletown, New Haven, New London, Norwalk and Waterbury; Stamford, agency not named.

Rhode Island: Providence Chamber of Commerce.

New York: Chambers of Commerce of Buffalo and Syracuse; Merchants' Association of New York City.

New Jersey: Asbury Park, Board of Commissioners; Carney, State Council of Defense; Dover, Jersey City and Trenton, Chambers of Commerce; Garfield and Montclair, Police Station; Millville, Maurice River Transportation Co.: New Brunswick, Home Defence League; Newark, Motor Truck Club of N. J.

Pennsylvania: Philadelphia, Chamber of Commerce.

Ohio: Cleveland, Chamber of Commerce.

Michigan: Detroit, Board of Commerce.

The Highways Transport Committee of the Council of National Defense is endeavoring to secure the establishment of additional bureaus throughout the territory north of the Potomac and Ohio rivers and east of the Mississippi, where transportation conditions and freight congestion are most serious.

ELECTRIC PUMPING FOR MUNICIPAL WATER WORKS.

Deep-Well and Surface Pumps for Small Plants—Steam, Oil and Electricity Compared as Power for Such Plants.

A study of the pumping plants connected with municipal water works in the state of Iowa has been made by H. W. Wagner, mechanical and electrical engineer for the Engineering Experiment Station of Iowa State College, and a bulletin treating of electrical pumping as practiced in these plants has been published by the station. The bulletin goes quite thoroughly into the results of tests made at a number of plants, giving the complete data determined by such tests. The general discussion and conclusions are given in brief in the following abstract.

In most Iowa cities and towns, the total first cost of municipal water works averages between $100 and $150 per connected service. Not only does the community system afford fire protection such as is not possible with separate individual installations, but the amount named would fall short for paying for an individual well, pump and storage tank, to say nothing of power machinery or of the inconveniences of pumping by hand. Many of the communities having public supplies have populations of only 300 to 500.

In order to make the operation of such plants practicable, it is necessary that both pumps and power machines employed be reliable and economical. Direct-acting steam pumps are very reliable but are economical only in large sizes. Addition of crank and fly-wheel or separation of pump and engine tends to reduce the steam consumption for pumps of moderate size. In many small plants gasoline power has taken the field away from steam power. A gasoline engine eliminates the boiler plant, the liquid fuel is convenient to store and handle, the engine can be started in a minute, and prohibitive operating costs are overcome. Engines burning kerosene and heavier, less costly oils, have proved even more economical in fuel cost than gasoline engines, except possibly in very small sizes.

The present tendency, however, indicates that the electrical motor is replacing all types of pumping engines. An electric pump is suitable not only for the small unit but also for replacing the large and economical steam pump. A steady, reliable electric current, always at hand, affords the maximum of convenience and the minimum of attendance and care. Where power is to be distributed to several widely separated wells, electricity is incomparably superior to steam. The over-all economy of electric pumping in comparison with engine pumping is still a matter of opinion, but engineers seem to favor electricity for muncipal pumping when reliable current can be obtained at a reasonable rate.

Practically all power pumps designed to be driven by belt, gear, chain or direct connection are adaptable to operation by electric motors. The pumps commonly used in municipal plants may be classed as deep-well pumps and surface pumps. The largest flows from deep wells of moderate bore are obtained by the air-lift and propeller pumps. For a given capacity, the centrifugal pumps require the largest well bore.

DEEP-WELL PUMPS.

When the water stands at a great distance below the surface the air-lift is most reliable. Reciprocating and centrifugal pumps are made for higher heads than is the propeller pump; but very long shafts on any of these three types are liable to be a source of trouble. The air-lift is best adapated to a well shaft that may be crooked or out of plumb. It is also less injuriously affected by water containing gritty materials and injurious chemical compounds. Sand wears the valves and cylinder of a reciprocating pump. Centrifugal and propeller pumps do not have these parts, but impure water may cause rapid wear of the vanes in a centrifugal pump.

For a capacity of about 200 gallons per minute raised against a head of 100 feet, the first cost of a centrifugal pump is higher than for any other of the three types of deep-well pumps, and that of the air-lift (including compressor) is the least.

The higher the pump efficiency, the smaller the motor that can be used and the less the power cost. In ordinary operation, the above four types of pumps can generally be arranged in the following order as to efficiency; reciprocating, centrifugal, propeller, air-lift. Cost of attendance and repairs depends upon pump capacity and the type of pump chosen for a certain set of conditions. Reliability and length of useful life also depend upon type of pump and its fitness for existing conditions.

SURFACE PUMPS.

Of surface pumps, the electrically driven types now commonly employed are the vertical cylinder, single acting plunger, triplex pump, and the horizontal shaft centrifugal. Double acting piston and rotary pumps are sometimes used. The single stage centrifugal pump is generally suitable for low heads and large capacities as compared with the triplex plunger and piston pumps and with the rotary pump. Triplex pumps are higher in first cost than the surface centrifugal pumps. The first cost of rotary pumps has a wide range depending upon the quality and make, but is lower than that of triplex pumps. For moderate and high heads the power cost is lower and the efficiency higher for triplex and rotary pumps than for single-stage centrifugal pumps. A triplex or rotary pump operated at a constant speed with a range of head maintains capacity and efficiency much better than does a centrifugal pump.

As to reliability, the centrifugal pump has fewer parts to get out of order than has the triplex, but the higher speed of the former demands careful alignment of shaft and attention to bearings. The triplex pump is generally considered more reliable than the rotary.

For fire service, the electrically driven underwriters' multiple-stage centrifugal pump is comparatively simple and reliable.

A summary of makers' prices and rated efficiencies of both deep-well and surface pumps is given in the accompanying table:

RANGES OF PRICES AND RATED EFFICIENCIES OF DIFFERENT TYPES OF PUMPS.

(Prices quoted in 1916)

DEEP WELL PUMPS.

Specified capacity, gallons per minute	100	200	400	500
Specified head	100 ft.	100 ft.	100 ft.	100 ft.
1. Reciprocating:				
Rated efficiency	82.3%	70, 82%	..	..
Price, dollars	600	1060, 1100	..	..
2. Centrifugal:				
Rated efficiency	..	48%	..	55-67%
Price, dollars	..	1350	..	1496-1687
3. Propeller:				
Rated efficiency	..	25-30%	30-35%	..
Price, dollars	..	1200	1600	..
4. Air-lift:				
Rated efficiency	..	30%	..	30%
Price, dollars	..	745	..	1170

SURFACE PUMPS.

Specified capacity, gallons per minute	200			500		
Specified head	50 ft.	100 ft.	200 ft.	50 ft.	100 ft.	200 ft.
5. Plunger (triplex.:						
Rated efficiency	..	67-75%	77, 78%	..	..	82, 83%
Price, dollars	..	850-340	725, 412	..	..	1525, 900
6. Piston (triplex):						
Rated efficiency	70%	..	..	..	..	..
Price, Dollars	750	..	..	..	..	..
7. Centrifugal:						
Rated efficiency	56%	55, 58%	62, 64%	68%	64, 67%	56, 69%
Price, dollars	177	100, 177	450, 420	315	115, 315	425, 640
Rated capacity gallons per minute	90	300	450	..	100-175	..
Specified head	100 ft.	100 ft.	100 ft.	..	100 ft.	..
8. Rotary:						
Rated efficiency	65%	65%	65%	..	50%	..
Price, dollars	55	115	140	..	250	..

OBSERVATIONS FROM PRACTICE.

Electricity seems to be gradually replacing the forms of power for pumping where reliable current is available. Some municipalities hesitate to change from steam, however, because they consider that a steam plant under local control is more reliable for fire protection than current received over a transmission line. With reliable current, however, electric pumping gives general satisfaction because of the low cost of machinery and the convenience and low cost of attendance. But if the current is undependable or the voltage unsteady, electric pumping is unsatisfactory.

In small towns the deep-well reciprocating pump is most commonly found, and, when the lift to the surface is moderate, the same pump delivers the water into an elevated tank or pneumatic pressure tank.

Air-lifts are employed for very high lifts and under other conditions not suitable to other types of pumps. In practically all cases, when used, the air-lift pumps only to a surface reservoir.

Pumps are seldom installed in deep wells of more than 20 inches in diameter. Additional wells are drilled when more capacity is required. Various types of pumps are installed in these wells. A number of deep-well pumps may feed into a common surface reservoir from which the second-stage work is done by high pressure pumps.

Centrifugal pumps are often used for pumping from streams and lakes against low and moderate heads.

Second-stage electric pumping is generally done by single-acting triplex pumps. The cylinder sizes of most triplex waterworks pumps in service in Iowa are within the ranges of 4 x 6 and 12 x 12.

In many cases arrangements are made for off-peak pumping; that is, the electric pumps are operated during the daytime or late in the night when the electric lighting load is low. The central station is better able to carry the pumping load at such periods and a more favorable pumping rate often results. In the case of a small storage battery central station, however, it is not likely to prove profitable to operate the engine and generator for pumping only.

To be continued.

WATER WORKS OPERATION—LEAKAGE AND WASTE.

When and Why it is Necessary to Reduce Leakage and Waste to a Minimum—Methods Available for Detecting and Locating Them.

A very large percentage of the water that enters the distribution systems throughout the country performs no useful service whatever. Some of it escapes from the mains and appurtenances and service connections underground, another part escapes through faulty plumbing in the connected buildings, while a part of that which is withdrawn for a real purpose, such as preventing pipes from freezing in winter or obtaining cold water for drinking in summer, may be considered an unjustifiable use of the water, in that in the long run the purpose served is not commensurate in value with the loss to the city as a whole in waste of water, reduction of pressure, and diminution of the supply available for fire fighting or other emergencies.

NEED FOR ELIMINATING WASTE.

Where the quantity of the supply at the source is limited, there can be no question in the minds of even the consumers themselves that all such leakage and waste should be reduced to a minimum. Where the supply is abundant, however, even water works superintendents themselves sometimes fail to realize the importance of eliminating this useless consumption and leakage, especially in cases of gravity supplies abundant in quantity, where there is no expenditure for either pumping or purifying the water. In many such plants the water departments even encourage the liberal use of water and considers it a virtue to do so. To such we suggest the following considerations, briefly stated:

The sizes of the mains leading from the reservoir to the city and of the distribution pipes are presumably calculated on the basis of a certain per capita consumption. If the unit consumption used in the calculation was larger than called for by reasonable demands, then the pipes provided were larger than necessary, and the city is making an unnecessarily large annual disbursement for interest and sinking fund on such cost. If the mains were not designed for such large consumption, leakage and waste (to an extent that may even be enormous in the case of a small city) is possible when domestic consumption only is being withdrawn from them, because of the capacity provision made for fire consumption. If, however, the emergency demands of a fire should be made upon the mains, this added to the enormous waste of water (which would unquestionably continue during the fire) would find the mains taxed beyond their capacity, as a result of which either quantity or pressure, and probably both, would be lacking. It may be the case that the capacity of the system, designed for possibly thirty years in advance, is so much greater than that demanded at present that double the estimated per capita consumption can be carried by it without danger; but in permitting the consumers to thus waste the water or in overlooking leakage or other losses directly from the system itself, those in charge of the water works are permitting a habit of

CLEANING MAINS, LEAKAGE AND METERS (Concluded).

City and state	Do mains need cleaning at intervals?	Method of cleaning	Methods of detecting and preventing leakage and waste	Is leakage enough to make radical action desirable?	Percentage of services metered	Owner of meters*
South Carolina:						
Beaufort	....	Flushing	Inspection	No	None	....
Bennettsville	No	....	Meters	No	99	Consumer
Camden	Yes	Flushing	Inspection	No	50	City
Darlington	No	....	Meters	No	100	Company
Florence	Yes	Flushing	Sonoscope and aquaphone	No	80	City
South Dakota:						
Aberdeen	No	....	Meters	No	80	City
Mitchell	Yes	Not cleaned	....	....	100	City
Rapid City	No	Flushing	Test by districts	No	80	City
Watertown	No	Flushing	Meters	No	100	Consumer
Tennessee:						
Clarksville	No	Flushing	Meters	No	40	City
Cleveland	No	....	None	No	75	Consumer
Columbia	No	....	Inspection	Think not	25	Company
Greeneville	No	....	....	No	10	City
Memphis	Yes	Flushing	Pitometer and inspection	No	75	City
Murfreesboro	No	Flushing	Aquaphone	No	65	Company
Texas:						
Abilene	Probably	Never cleaned	Surface inspection	Possibly	94	Both
Austin	No	....	Meters	No	100	Both
Brownsville	No	....	Meters	Possibly[q]	100	City
Cleburne	No	....	Meters	No	67	Both
Galveston	No	....	Surface inspection	....	100	Consumer
Hillsboro	No	....	None	No	75	Consumer
Longview	No	....	District meters	No	99	Consumer
McKinney	No	....	Meters	....	100	City
Plainview	No	....	....	No	98	City
Vernon	Yes	Not cleaned	None	No	60	Both
Waxahachie	No	....	None	Yes	100	Both
Weatherford	No	....	None	Think not	90	Company
Utah:						
Salt Lake	Yes	By contract	None	Think so	23	City
Vermont:						
Barre	Yes	Flushing	Inspection	No	33	City
Bennington	No	....	Listening	No	Small	Consumer
Essex Junction	Yes	Flushing	Inspection	No	75	City
Northfield	No	Flushing	Meters	No	70	City
Richfield	No	....	Watchfulness	No	None	....
Rutland	No	....	Aquaphone	No	10	City
Virginia:						
Charlottesville	No	Not cleaned	Meters and aquaphone	Think not	65	City
Washington:						
Auburn	....	Flushing	....	....	6.5	City
Centralia	Yes	Flushing	Sounding	No	3	Both
Ellensburg	No	....	Sonoscope	No	15	City
Olympia	Yes	Flushing	Meters	No	80	City
Palouse	No	....	Patrol	No	100	City
Port Townsend	No	....	....	No	4	City
Pullman	Yes	Flushing	Meters and detectophone	No	100	Consumer
Seattle	Seldom	Flush	Repair leaks	No	98	City
Spokane	No	....	Pitometer survey and inspection	Yes	100	Consumer
Winlock	No	....	....	No	40	Company
West Virginia:						
Fairmont	Yes	Flushing	Meters	No	25	Both
Princeton	....	Flushing	....	No	90	Company
Wisconsin:						
Antigo	No	....	Detector	No	None	....
Baraboo	No	....	None	No	75	City
Beaver Dam	Yes	Flushing	....	No	85	City
Columbus	No	....	Detector	No	100	City
Fond du Lac	No	....	House inspection	No	70	City
Green Bay	No	....	....	No	100	Company
Janesville	No	....	Inspection	No	45	Consumer
Menomonee	No	....	None	No	40	Consumer
Milwaukee	No	....	Meters and patrol	No	99	Consumer
Oshkosh	Yes	Flushing	....	....	40	Consumer
Shawano	No	....	Detectaphone	No	98	City
Sparta	Yes	Flushing	None	No	100	Both
Whitewater	Yes	Flushing	Meters	No	75	City
Wyoming:						
Rock Springs	Yes	Flushing	Watchfulness	No	100	Company
Canada:						
Toronto, Ont.	Yes	Flushing	None	r	4	City
Winnipeg, Man.	No	....	Night inspection & aquephone	No	100	City

* The word "city" is used to designate municipalities of any nature or water districts; q—water waste survey contemplated; r—pitometer survey for years 1910 to 1917 showed considerable leakage.

wastefulness and carelessness to become fixed in the community, both among the consumers and among their own employees, which it will be exceedingly difficult to remedy when the demand for saving shall arise with the growth of the city.

Where the water is pumped or purified or both, there can be no question that every gallon uselessly put into and forced through the mains costs a sum that is a direct loss. It is sometimes figured that this loss is confined to the cost of the additional fuel consumed in pumping these additional gallons, and that this cost is less than that required to prevent the waste. This by no means fully covers the case, however. Many a city which has permitted waste to continue finally finds itself threatened with a water famine unless it shall spend thousands or in some cases millions in providing an additional supply, additional pumping plant, additional filters, etc. Then it hurriedly endeavors to reduce the consumption, only to find that the habit of waste has become so established with the people that, through fear of unpopularity or through pressure brought to bear by taxpayers and voters, they find it easier to spend these large amounts on extensions rather than to take the steps necessary to limit the waste. The cost of such waste then becomes not only that of the fuel consumed, but the interest and sinking fund on all of the new constructions required to meet the unnecessary demands, together with the maintenance costs of pumping plants, filters and other structures, the cost of en-

METERS, RATES, MUNICIPAL USE (Concluded)

City and state	Is deposit on meter required?	Is rental charged for meters? †	Does city obtain water without payment?	Use made of free water	Used for Municipal Purposes: Percentage	Used for Municipal Purposes: Is any of it metered?
South Carolina:						
Bennettsville	....	Some cases	Yes	Sprinkling, sewers, fire	20	Part
Camden	No	No	Yes	Sprinkling, sewers, fountains	15	No
Darlington	Yes	No	Yes	City buildings	......	All
Florence	No	$1.20	Yes	All public uses	33	Pub. buildings
South Dakota:						
Aberdeen	No	No	Yes	Hospital and schools	......	No
Mitchell	No	Minimum charge	Yes	....	......	Schools
Rapid City	No	No	Yes	All municipal uses	20	Schools
Watertown	....	....	Yes	Flushing sewers	......	All
Tennessee:						
Clarksville	Non-owners	Minimum charge	Yes	All but schools	15	Fountains
Cleveland	....	No	Yes	Sewers, public buildings, fire	......	No
Columbia	Seldom	No	Yes	City Hall, engine house, water troughs	6 to 10	All but sewers
Greenville	No	Yes	Yes	Streets, sewers, schools	5	No
Memphis	Yes	No	Yes	Flushing streets and sewers, parks, fires	10	Buildings
Murfreesboro	....	$3	Yes	Flushing sewers	10	Yes
Texas:						
Abilene	Non-owners	$3	Yes	Public buildings and water troughs	5	Yes
Austin	Yes	$3	Yes	Schools, parks, fire	......	All but flushing
Brownsville	Yes	No	Yes	Street sprinkling, sewer flushing, fire	......	33%
Cleburne	....	$3	Yes	All city purposes	12	No
Galveston	....	$\$3^{u}$	....	....	......	Schools
Hillsboro	$2.65	....	....	....	......	Schools
Longview	....	....	Yes	Parks and fire	3	No
McKinney	$1	$3	No	....	5	Yes
Plainview	No	No	....	....	5	No
Vernon	....	No	....	....	......	....
Waxahachie	Yes	No	Yes	All city purposes	15	All
Weatherford	No	No	Yes	Schools, City Hall, fountain	......	No
Utah:						
Salt Lake	Non-owners	No^{y}	Yes	Public b'ld'gs, parks, etc.	17	No
Vermont:						
Barre	No	No	No	....	......	No
Bennington	No	Yes	Yes	Water troughs	Small	No
Essex Junction	No	No	Yes	Flushing sewers	......	Schools
Northfield	....	Yes	Yes	Flushing sewers	......	No
Richfield	....	....	Yes	Fire	......	Schools
Rutland	No	No	Yes	City buildings, etc.	......	No
Viginia:						
Charlottesville	....	No	Yes	....	15	Yes
Washington:						
Auburn	No	No	Yes	Public works, etc.	4	No
Centralia	No	No	Yes	Fountains, flushing streets	0.1	Schools
Ellensburg	No	No	....	....	1	All
Olympia	No	No	No	....	......	Schools
Palouse	....	....	Yes	Flushing streets, fire	10	Schools
Port Townsend	No	Yes	No	....	......	All
Pullman	Yes	No	....	....	1 to 3	Schools
Seattle	....	No	No	....	12	Schools only
Spokane	....	No	No	....	w	Public bldgs
Winlock	No	No	Yes	Street sprinkling, 2 public fountains	5	No
West Virginia:						
Fairmont	No	Yes	Yes	Street flushing and fire	10	Schools
Princeton	No	No	Yes	Fire station	......	Buildings
Wisconsin:						
Baraboo	....	$3	No	....	......	Schools
Beaver Dam	No	$1	Yes	Flushing sewers	......	No
Columbus	No	....	Yes	Fountains	7	Yes
Fond du Lac	....	Service charge	Yes	Drinking fountains	......	Schools
Green Bay	No^{v}	Service charge	No	....	......	All
Janesville	....	....	No	....	......	Schools
Menomonee	....	....	No	....	......	Schools, city bldgs
Milwaukee	No	....	No	....	......	....
Oshkosh	Yes	....	No	....	......	Yes
Shawano	No	Minimum charge	No	....	8	Schools
Sparta	....	Yes	Yes	Flushing sewers	1	All but flushing
Whitewater	....	No	No	....	......	All
Wyoming:						
Rock Springs	No	No	No	....	1%	All
Canada:						
Toronto, Ont.	No	No	No	....	......	Some
Winnipeg, Man.	No	No	No	....	......	....

†Amounts given are annual rentals, in some cases reported as quarterly or monthly payments; u—city furnishes meter, consumer pays for same $3 a year for 5 years; v—collect in advance; w—will be 100% metered by July 1; y—installation charge of $2 to $8.

gineers and firemen and other attendants, and frequently increased overhead charges of other kinds. As an illustration, the city of Buffalo has during the past year or two been carrying on leakage and waste investigations by means of the pitometer and house-to-house inspection combined and, although only a part of the city has been covered, it has already been possible to close down one of the pumping stations during the greater part of the time and, with only a little more decrease in waste, it will be possible to abandon it altogether, thus saving the cost of the pumping station force and the upkeep of the plant as well as of the fuel. Had precautions been taken some years ago to prevent the waste which it is now eliminating, the entire cost of establishing this station could have been avoided.

There are any quantity of instances on record where there is no question about the economy of conducting a leakage and waste survey. One of the instances noted in Municipal Journal is that of Lancaster, Pennsylvania, where the leaks in the street mains that were discovered and stopped by a survey conducted during one season amounted to one and a quarter million gallons per day, the elimination of which saved the city about $17,000 a year based on pumping costs only, while the total cost of the survey was less than $3,000. The city of Washington for a number of years kept parties continuously in the field making such surveys, and records of the leaks discovered and stopped indicated almost every year that the cost during that year of making the survey was more than met by one year's pumping cost of the amount of leakage discovered and stopped during that year, without taking into account that the saving made during any one year would be repeated annually for an indefinite period.

METHODS OF DETECTING WASTE.

There are a number of ways of investigating leakage and waste. One is to look for the leaks themselves in the distribution system, inspect plumbing fixtures for leaks and endeavor to discover by detective work instances of waste by consumers. Another is to measure the amount of water going into the system and, comparing this with the number of consumers, judge whether the amount of per capita consumption (using the word consumption to cover all water that enters the distribution system) is excessive. In making such estimate, the possibility of large amounts being legitimately used for manufacturing or other commercial purposes should not be overlooked. For instance, in the case of Buffalo the per capita consumption was calculated to be more than 300 gallons per capita, and it might seem that at least two-thirds of this was waste. Investigation revealed, however, that about 110 gallons per capita was being used through meters for commercial purposes and, being payed for by meter, was probably being used legitimately.

This plan of estimating per capita consumption is, of course, only a first step to determine whether there probably is sufficient leakage and waste to warrant further investigation. The same general principles are frequently employed in the investigation itself, the city being divided into small districts and the population, commercial uses, and total consumption in these districts determined, or the consumption determined during the night when it should be practically nothing. For locating individual leaking fixtures or instances of waste, the same idea of determining night consumption is applied to individual consumers, generally by some form of apparatus for conveying and magnifying the sound caused by water flowing through the service.

A comprehensive survey will generally employ all of these methods, first determining in a general way the extent of the leakage or waste for the entire city, then determining the amount in each of several districts and, where the amount of district waste so determined seems to warrant it, locating the exact pipe joint, appurtenance, service, or building at which such loss of water occurs.

The loss being located, the matter of stopping it is simple if it be a leak, consisting merely of replacing a broken pipe, remaking a defective joint, repairing or putting into condition a leaking valve or hydrant, or requiring a consumer to replace defective plumbing.

Stopping of waste, however, is a much more difficult matter, since waste stopped today may begin again tomorrow and continue unabated until rediscovered by a future investigation. A common, and until within recent years the most common, method of endeavoring to prevent waste was house-to-house inspection. This seldom has proved more than partially successful, however, for the reason just stated—that such inspection stops the waste only temporarily, while the cost of it prevents the visiting of all premises at short intervals, and also because it is difficult to secure a sufficient number of inspectors who will faithfully perform a service that brings them the dislike of the majority of the consumers, some of whom may have influence politically or otherwise that can be used to the disadvantage of the inspector. It is now, we believe, almost universally considered that the only method of successfully minimizing waste is to have an inspector continuously on the job, and one that cannot be influenced by personal motives or political pressure, and the only inspector of this kind that has been discovered that can be furnished at practicable cost is a water meter.

A RESERVOIR PARK IN ALBANY.

Years ago the city of Albany, N. Y., located a reservoir on a piece of property known as the Tivoli lakes property, on which are two lakes in addition to the reservoir, which reservoir was constructed as a part of the gravity water supply system. Recently there has been a sentiment in favor of making this property over into a park, with particular provision for recreational facilities.

During the summer of 1916, the Bureau of Engineering made a topographical survey and map of the property and referred the matter of the development of this tract into a park to Charles Downing Lay, consulting landscape architect to the city. After a series of conferences, Mr. Lay, in October, submitted a report that was very satisfactory. The topography of this tract readily lends itself to park purposes, and the various features recommended and planned will give facilities not alone for recreation but also for rest and quiet.

Briefly summarized, the plan provides for changing the location of a boulevard that runs through the property; constructing ten tennis courts in one part of the property, eleven in another, two full-sized regulation baseball diamonds, three parking spaces for automobiles, with ample room for a total of one hundred and thirty cars, and a playground with playground apparatus for small children. A space will be set apart in the smaller lake for seven hockey rinks, the larger lake reserved for swimming and boating in the summer and plain skating in the winter, and one of the arms of the larger lake reserved as a wading pool for small children in the summer and for figure skating of adults in the winter. The other of the two arms of the larger lake will be reserved for the sailing of toy boats and wading in summer and for the skating of children in winter. On one of the highest and longest hills it is proposed to have a slide for coasting which will take coasters out over the ice of the larger lake for some distance. The location of a casino and bath house is indicated on the plan and provision could be made on the roof for a band stand for municipal concerts. Besides the features outlined, there are roads and paths to be built and changed, planting of trees and shrubs to be done, underbrush to be cleared out and seeding of open areas for grass.

Anticipating the future development of this property, the Common Council has passed two ordinances which will do much toward making it a park. One ordinance authorizes the construction of a trunk sewer to connect up the sewers from Arbor Hill which now discharge into the lakes, thus removing the pollution now discharging into the lakes and preparing the way for the use of the larger lake for swimming, boating and wading in the future. The construction of this sewer has not yet been undertaken because of the high prices prevailing last summer and the need of devoting all the resources of the Bureau of Engineering to the completion of some larger and necessary public improvements during last summer and fall. The other ordinance provided for the extension, grading and paving of a street to give access to the park. The grading work of this latter improvement was placed under contract and should be completed this summer.

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THE CITIES' PEACE PROBLEM.

That we are not naturally a war-like nation is offered as the reason why we were not prepared to take active part in the war in which our soldiers are just beginning to make themselves felt. We will not, therefore, be able to offer the excuse that we are not a peaceful nation if the return of peace also finds us unprepared.

During the year past one and a half million men in the United States have been more or less gradually withdrawn from peace pursuits for active warfare, and a much greater number for industries directly connected therewith; and probably an equal number will be withdrawn during the coming year. It will perhaps be no exaggeration to say that ten million of our citizens, and possibly twenty, will be directly engaged in war work. On the day that peace is signed this ten or twenty million will instantly be released from war work to return to peaceful industry. Three-fourths of this number are already here and those in France (in Germany then, we hope and believe) will be returned as rapidly as ships can bring them. What is to be done with them?

The industries that formerly employed them have adjusted themselves to get along without them, and readjustment for taking them back can be only gradual. It will be up to the government to provide for them. And this provision must be in the form of work—any other kind of provision would be disastrous. And in this the federal government will need the aid of all state, county and city governments. Every city should be ready to provide immediate work for at least double the number of men that left it for the war zone, since, even allowing for those that will never return, those engaged at home in war industries will swell the total to this number.

The following is quoted from the annual report of Charles H. Wacker, chairman of the Chicago Plan Commission:

> Although I am unalterably opposed to undertaking anything which could interfere with the successful prosecution of the war, I am certain that it is a great mistake not to prepare for peace in time of war. Other countries are doing this, but as yet we are not. Unless we begin at once, we will be just as unprepared for peace, industrially and commercially, as we were unprepared for war.
>
> We must "keep the home fires burning." When the war is over, thousands upon thousands of our boys will return to their homes to be confronted with lack of employment, possibly depleted in health, and requiring the work, nurture and protection our preparedness program then can afford them. And when the war is over, factories that are now making munitions, building ships, and working to the fullest capacity to carry on the different branches of war industry, will have largely ceased this work, adding to the ranks of the then unemployed, particularly during the period of rehabilitation and readjustment.
>
> Is it not plainly the duty of the city to be ready at that time to carry on great construction projects, requiring the use of money, labor and material, preparation for which must be made in advance? We should prepare so that we can give workingmen employment and not make them objects of charity.
>
> After the war more than ever will there be needed public improvements of a character that will give the people more light, air, recreation, health, and freedom from congestion—improvements that will tend to their general health, happiness and well-being, in order that they may remain a strong, a virile, and a capable people—and, remember, please, that the people's demand for these humanitarian benefits will be stronger and more insistent after the war than ever before in the history of our country—and it must be met.

There, it seems to us, is the answer. There is none too much time if the cities should all begin at once to plan work for these men. It should not be wasteful work—construction that serves no useful purpose or a puttering at pretended work that is merely a cloak for charity. There is no need for this. We believe that any city can find ways to employ five per cent of its population in needed improvements—improvements that have been delayed or abandoned because of the war. The essential need is to have plans for these all prepared beforehand so that work on carrying them out can be started on a week's notice.

Let the city planners get to work at once—not the aesthetic but the practical, engineering kind—and let councils adopt definite projects for future improvements. Then let these be developed to the point where telegrams can be sent to manufacturers on an hour's notice ordering steel, iron pipe, vitrified pipe, cement, stone, brick, etc., so that they may at once employ a part of the men in producing these materials; to the point where laborers and trucks (there should be thousands of war trucks available) can be set at work immediately at grading streets, clearing sites, digging trenches and other preliminary work; while the returning engineers can be employed in the supervision of the work.

Let every city official try to imagine in all its practical details the problem that will confront his city the day after its boys return home and get busy preparing to meet it.

MUNICIPAL BONDS OVERSUBSCRIBED.

It is encouraging to those cities that are expecting to issue bonds this summer that the five and a half million dollar issue of Philadelphia was over-subscribed five times by thirty-seven bidders a few days ago. These were 4½ per cent. thirty-year bonds and brought a premium of 2.177 per cent.

THAWING SERVICES AND HYDRANTS AT WINDSOR.

By H. R. TURNER.*

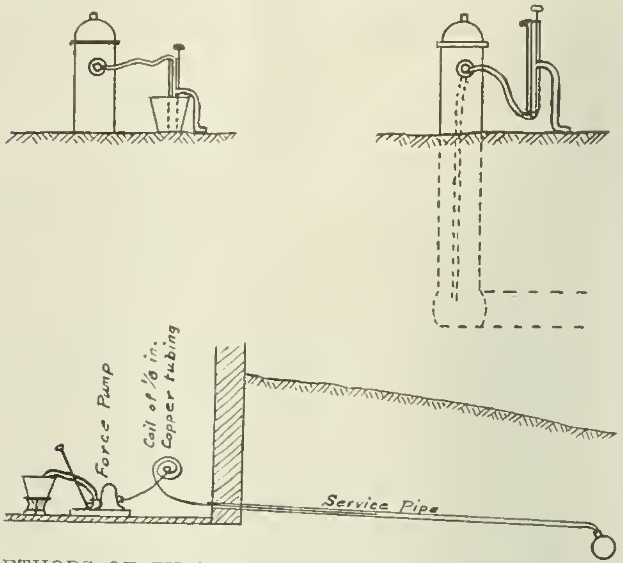
The fire district of Windsor, Connecticut, like most other cities in the northern part of the country, had more or less trouble last winter with the freezing of fire hydrants and house connections, although no mains were frozen. The method employed in thawing service pipes is one that seems to be used quite extensively in Connecticut. The apparatus required consists of a coil of about 100 feet of ⅛-inch copper tubing, a hand force pump, a pail, and a gasoline furnace. In thawing a frozen house service, the service is disconnected at the stop and waste valve in the cellar and one end of the copper tubing is inserted into the service pipe at this point. The other end of the tube is connected to the outlet of the force pump. The suction line of the force pump is inserted in the pail which is filled with water, the water being heated by a gasoline heater on which the pail is placed. When the water is sufficiently hot, it is pumped by means of the force pump through the copper tubing and thaws the ice ahead of the tube, the hot water and that from the melting ice flowing back through the service pipe into the cellar. The tube is pushed forward into the service pipe as rapidly as the melting ice will allow.

This method of thawing requires the services of one skilled man and two laborers as helpers. The longest service thawed by our district last winter was 109 feet of ¾-inch pipe. The rate of thawing was from twenty to twenty-five feet per hour of ¾-inch pipe. The largest service thawed was a 1½-inch pipe.

For thawing fire hydrants, the apparatus used was arranged by the writer, who has found it very convenient for use when the number of hydrants with frozen barrels is small. The apparatus consists of an ordinary bucket spray pump (such as is commonly used in spraying small fruit trees), 8 feet of ½-inch garden hose, and one female brass hose connection. The screen in the bottom of the pump barrel is removed and the female hose connection soldered on in place of it, so that the ½-inch hose can be attached to serve as a suction line.

In thawing a hydrant, the pump, without the hose, is set in a pail of boiling hot water, the hose is attached to the discharged end of the spray pump, and the hot water is forced through it into the barrel of the hydrant. Two pails of boiling water is the largest amount that I have found it necessary to use in thawing a hydrant barrel that was completely frozen for about five feet in depth.

After the barrel has been thawed out, the hydrant is thoroughly flushed, and if the drain valve is not working properly the eight-foot length of hose is attached to the base of the pump and the end is inserted in the hydrant barrel, and the barrel is pumped out.



METHODS OF THAWING HYDRANTS AND SERVICES AT WINDSOR, CONN.

This method of thawing and pumping out hydrant barrels was found very effective during the past winter, as it required only a small number of tools and the service of two men for about one-half hour on each frozen hydrant. It has proved a very simple method of thawing fire hydrants where the frost has not penetrated deep enough to freeze the connection between the hydrant and the main. In cases where hydrant barrels are found full of water, this same pump attachment is used for draining the barrels.

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*Superintendent of Windsor Fire District.

ASPHALT ON RESTRICTED IMPORTS LIST.

The War Trade Board has placed asphalt on the restricted imports list, imports for 1918 being limited to a total quantity of 30,000 tons from Venezuela and 32,000 from the Island of Trinidad. All outstanding licenses for the importation of asphalt are revoked as to shipments made after June 15th, 1918. Allocation of the amounts permitted to be imported, regulation of the price and other details will be arranged after conference with the War Industries Board.

PUMPING STATION PARK AT REDLANDS.

The pumping station of the Redlands, Cal., water works, is located in a plot of 22 acres of land, and this has been given a simple parking treatment, consisting of driveway, walks, lawns and shrubbery, as shown in the accompanying illustration. These grounds are open to the public for picnics or play grounds and are maintained in the same way as the other city parks, city engineer George S. Hinckley informs us. The reservoir shown in the photograph is used for irrigation purposes only, so that the possibility of pollution by visitors is not a matter of concern. The water used for domestic use is pumped to a reservoir on an adjacent hill from the side of which this photograph was taken. The pumping plant has a capacity of 13,000,000 gallons per day.

REDLANDS PUMPING PLANT AND IRRIGATION RESERVOIR.

The WEEK'S NEWS

Indiana's State Highway Department in Difficulties—New Government Committee on Highways—Passaic Valley Sewer Contract Litigation—Washington's Venereal Disease Campaign—Power Conservation in California—Eliminating Vice in Toledo—Philadelphia Sells $5,500,000 Bonds at Good Premium—Roanoke Has Double Election—New York's Proposed New Pension Plan—Edmonton, Canada, Raises Fares on Municipal Car Lines.

ROADS AND PAVEMENTS

State Highway Department Disintegrated.

Indianapolis, Ind.—L. H. Wright, chairman of the state highway commission, has announced that the commission has released from its employ its entire force, consisting of approximately forty engineers and assistants and other workers, pending the decision of the supreme court in the case before it on appeal from a Hamilton county court, which declares the highway commission law invalid. The action has been taken, according to Wright, because the commission did not wish to incur any expense in connection with work under the highway law, until it has been definitely established that the law is valid. In case the supreme court should hold it invalid, expense incurred by the commission could not be met legally. In the case of William S. Moore, state highway engineer, whom the commission had employed at a salary of $4,500 a year, Wright said the commission had retained him in his position, but had ceased the payment of his salary. Wright does not know whether Moore will continue to hold his position with the commission, pending the decision of the court, or whether he will sever his connections with the state body. The latter condition is anticipated. Pending the decision Wright and a bookkeeper are handling what business is possible. Federal matters, pertaining to road supervision in the state and some inspection work are being done, Wright said.

Vote Bond Issues for Lincoln Highway Construction.

La Porte, Ind.—Acting in conjunction with the other communities in the state through which the Lincoln Highway passes, the Lake county council has voted an appropriation of $300,000 for the permanent improvement of the local section of the trans-continental route. Twelve miles of road will be built, extending from Schererville to the county line. The road will be either of concrete, brick or asphalt. It is anticipated that a state appropriation of $75,000 will be added to the funds provided by the county, making possible the expenditure of a total of $375,000. The bonds will be placed on sale at the earliest possible date, and actual construction started at the first available opportunity.

New Federal Committee to Encourage Highways.

Washington, D. C.—As a result of a two-day conference between federal officials and representatives from the state councils of defense of twenty-three states it is expected that the attitude of the government towards highway construction as a national need will soon be more clearly and favorably defined. A government policy of highway development—even to replace the short-line steam railroads—may be worked out and truck manufacture and necessary highway construction encouraged. Under the auspices of the Highway Transport Committees of the Council of National Defense, of which Roy D. Chapin is chairman, delegates from Alabama Connecticut, Colorado, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachussetts, Michigan, Missouri, New York, New Jersey, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, Wisconsin, West Virginia and the District of Columbia discussed immediate action on good roads, state-wide return load bureaus and rural motor-truck express routes. R. C. Wright, assistant traffic director of the railroad administration, declared that Director-General McAdoo is most heartily in favor of highway transport development. Mr. Wright expressed the opinion that motor transportation over the highways will eventually do away with the short line railroads, which, he said, have always been a serious burden to steam transportation.

D. C. Fenner of New York City, David Harper and J. F. Winchester of New Jersey and state highway commissioner Bennett, of Connecticut, described the work of the return loads bureaus of their respective localities. F. C. Ertsman, secretary, Highways Transport Committee of Illinois, and W. E. Hull pointed out the economic waste of the poor roads in their state aand urged government assistance. Rural motor truck routes were urged by F. C. Marquis, member of the Highways Transport Committee, having charge of this phase of the committee's work; P. R. Wilson, food administrator of Washington, and J. N. Barnsley, who operates such a line. The United States Department of Labor was represented by C. T. Clayton, who said that the inauguration of adequate rural truck lines would be equivalent to placing 100,000 efficient farmers at actual work on the farms, this labor being wasted in long trips to cities and other transportation difficulties. The National Automobile Chamber of Commerce has been promoting the rural express idea, as described by S. A. Miles. George H. Pride, of the committee, pointed out that these two phases of transportation were dependent on good roads. Delegates from a number of states complained that money set aside for road improvement cannot be used for that purpose because of disapproval by the capital issues committee. A federal road policy was made the subject of a resolution unanimously passed and presented to the Council of National Defense. Captain Vandervelde of the motor transport section of the French army described how the good roads had saved France at the 1914 battle of the Marne. He declared that without 2,000 trucks, mostly of American make, which operated continually day aand night carrying ammunition, food and other supplies to the troops, Verdun would be in the hands of the Germans to-day. He declared that all systems of transportation except the trucks broke down. Mr. Chapin brought out the fact that Great Britain has recently appointed a road transport board, to which has been turned over every sort of vehicle in England, Scotland and Wales, excepting farm wagons.

H. G. Shirley, secretary of the Highways Industries Association, and formerly state highway commissioner of Maryland, urged that motor truck development be not allowed to outrun highway development. Lieut.-Col. W. D. Uhler, speaking for Quartermaster General George W. Goethals, declared that the motor trucks have helped immeasurably in speeding up war work, particularly in the utilization of them in hauling emergency materials. He stated that 6,000 trucks have been moved from Detroit and other Western cities to the seaboard, each carrying a full load of freight. He cited the transfer of the entire office equipment of the Emergency Fleet Corporation from Washington to Philadelphia as an instance of the emergency service the trucks are rendering. He said that launching of merchant ships has been materially speeded by delivery of needed parts of engines and other machinery by truck, and that regular army truck lines have been established to carry goods, asked in emergency orders of General Pershing, from factory to ocean transport.

A few days after this conference a new government highways committee was formed. It consists of representatives of the War Industries Board, the Fuel Administration, the United States Railroad Administration, the Highways Transport Committee, the Department of Agriculture and the Motor Transport Service of the Army. The main functions of the new committee will be to cooperate with the state authorities in the development of highways, to coordinate the various agencies interested and to clear up the complexities of the situation. At the head of the new committee will be Logan Waller Page, director of the Office of Public Roads of the Department of Agriculture. The Highways Transport Committee will be represented by Roy D. Chapin and the army by Lieut.-Col W. D. Uhler. It is planned to functionalize the work of the committee, the Fuel Administration deciding upon asphalt questions; the War Industries Board having charge of cement, stone, etc.; the rail administration determining matters of transportation; the Highways Transport Committee passing on the commercial and the Motor Transport Service on the military necessity of specific highways.

SEWERAGE AND SANITATION

Settle Passaic Valley Sewer Contract Suit.

Newark, N. J.—Settlement of the long standing controversy between the Passaic Valley Sewerage Commission and the O'Rourke Engineering Construction Company of New York has been effected, the latter having agreed to accept $72,167.97, with interest at 6 per cent. from June 16, 1916, as payment in full and to drop a suit for $1,164,336.94 that has been pending in the United States district court since March of last year. The interest will amount to about $8,000. Of the $72,167.97 the commission admits that it owes the company $22,167.97, and the remaining $50,000 had been held as a guaranty that it would perform its contractual obligation. In the action against the commission the company, which had the contract for the sewer in what is known as Section 2, reaching from a point under the Hudson Boulevard in Bayonne, out under New York Bay to Robbins Reef Light, claimed serious losses and heavy expenditures as the result of alleged misrepresentation by representatives of the commission concerning the nature of the ground through which the outfall tunnel was to be driven, as well as losses of profits on the portion of the work given up with the beginning of the controversy. In the complaint served upon the commission the company said in part: "The chief engineer, with knowledge and consent of the commissioners, did falsely, fraudulently and deceitfully make statements for the purpose of deceiving and defrauding the plaintiff and inducing the plaintiff to bid on and make said contract at a price for which the service could not be performed without loss of money to the plaintiff." In the detailed claim against the commission most of the items cited were for extra work, said to have been necessitated by the ground conditions, and for the additional equipment the company claimed it was forced to get to meet the situation. The contract was awarded March 3, 1914, and it was virtually abandoned on March 1, 1917. The contract took in a stretch of 15,000 feet, and of this about 5,000 feet was completed, the company received $426,968. The remainder, the amount of the settlement, was retained by the commission. The commission claimed there was no misrepresentation in the preparation of the specifications upon which the company bid for the contract, and the amount of the settlement was the same as a previous offer to the company.

City Wants Water Company to Pay for Sewer.

Jersey City, N. J.—Under authority of a rule allowed by Chancellor Walker at Trenton application in behalf of Jersey City will be made before vice chancellor Stevens at Newark, for permission to review the proceedings involving the settlement of the dispute between Jersey City and the East Jersey Water Company over the purchase of the Jersey City water plant under the Flynn contracts of 1899. The purpose of the present proceedings is to compel the East Jersey Water Company, rather than Jersey City, to pay for the construction of the $1,000,000 intercepting sewer to be built in the Rockaway Valley to protect Jersey City's water supply from pollution by the towns of Dover, Boonton and Rockaway. The application made to the Chancellor by Albert C. Wall, as special council for Jersey City, adds another chapter to the long series of litigations involving the Flynn contracts for building Jersey City's water supply plant at an approximate cost of $7,500,000. Following years of litigation the city, under a decree of the court, paid over the bulk of the contract price and took title to the water plant. The decree of the court, however, set aside portions of the contract price to be held in abeyance, pending certain eventualities relating to the contract. One of the contentions made by Jersey City was that the water company had not provided sewers and sewage disposal works to protect the purity of the water, as required by the contract. As an alternative to the construction of such sewers and disposal plant the water company proposed to install a disinfecting apparatus, using a bleach or chloride of lime as a means of making the water safe. It was represented that this plant could be installed for approximately $20,000 and that it would preserve the purity of the water as effectively as the million-dollar expenditure proposed for a trunk sewer. In view of the experimental nature of the chloride process, whose adequacy at that time had not been tested, the court decided to permit the installation and to hold in abeyance so much of the contract price as would be necessary for the installation of the trunk sewer. In presenting his case to Chancellor Walker, Wall said that during the seven years Jersey City has operated its water plant there has been cumulative evidence that the disinfecting plant is not an adequate substitute for the sewers and disposal works contemplated by the contract.

Legalities Stop State-Wide Disease Campaign.

Olympia, Wash.—Plans for handling Washington's state-wide campaign against venereal diseases through the establishment of large general internment camps, must be temporarily abandoned. Not until the legislature changes the laws and provides enabling legislation can groups of several counties cooperate in support of one big receiving hospital. Each county within the state in the meantime must deal with the situation as an independent unit, and care for its own disease sufferers. The ruling comes from attorney general W. V. Tanner, who was asked to pass upon the question of whether one county could send its disease sufferers into another county for treatment.

Spokane, Wash.—The attorney general's ruling does not affect Spokane's individual program for handling social disease cases, which has resulted in the reorganization of the health department and the employment of more doctors and nurses, according to city commissioner Charles Fleming, but it will halt immediate plans for securing the use of old Fort Spokane as a big general internment camp for disease victims from all over eastern Washington. "We shall go ahead with our preparations for taking care of social disease cases for the city and county of Spokane, right here in the city," said Mr. Fleming. "These will be cared for at the city's contagion hospital and in connection with the emergency hospital, recently brought under the juristiction of the health department. I have no doubt, however, that the next legislature, meeting in January, will make provisions under which the state will handle these cases in big general hospitals or internment camps, serving several counties, instead of requiring each county to handle its own social problem. Should that be done, I anticipate that our committee will go ahead with efforts to obtain as an internment camp for the eastern part of Washington and possibly the old quarantine station at Diamond Head, out of Seattle, for the western part of the state." Reorganization of the city health department agreed upon by the city council some time ago as a means of expediting the handling of the social disease quarantine urged by the war department has become effective. Dr. H. Ransom of Clarkston, Wash., has arrived here to assume charge of the campaign and of the emergency hospital, which under the reorganization, passed from the jurisdiction of the department of public safety into the control of the health department.

STREET LIGHTING AND POWER

Commission Suggests Lower Profits for Utilities.

Lewiston, Ida.—In giving the Pacific Power & Light company, of Lewiston, permission to advance its rates temporarily the public utilities commission, in its order, has adopted the policy of allowing public service corporations to increase charges during the war because of the necessity many are put to meet operating expenses. The Lewiston company wanted to increase its rates materially. The utilities commission after an investigation agreed to a slight advance in prices charged for gas with the understanding that a new ruling would be forthcoming after the war. In the opinion of the commissioners many of the public service corporations which made a fair return off of money invested before the war now find it difficult to meet expenses. When passing on the Lewiston company's application the commission said: "There will no doubt be some increase in expenses on account of increased costs of labor and materials, but the commission does not feel that it must authorize such increase in rates as will permit the company to declare the same dividends as were earned in the past. We are living in unusual times. All are called upon to forego many pre-war privileges and luxuries, and the commission believes that the stockholders of the company should bear a portion of the increased burdens incident to the war."

Commission Allows Gas Rate Increase.

Bridgeton, N. J.—Permission to raise the rate for gas from $1 per thousand feet to a net rate of $1.12½ has been granted the Bridgeton Gas Light Company by the state board of public utility commissioners. The application for permission to increase the rate was made by the gas company on December 17, 1917. The application was opposed by a hastily organized citizens' protective league, and there was also a committee appointed from city council to look after the interests of the taxpayers in the matter. The board finds that a war surcharge of 15 cents per thousand cubic feet may be added to the existing rates, subject to a discount of 2½ cents per thousand cubic feet on bills for gas sold through regular meters if the bills are paid within ten days after presentation. These rates may be effective for sales made from May 1st, 1918. Acceptance by the company of the increases allowed will be taken as a stipulation that abrogation or modification of the war surcharge may be made as and if conditions as indicated by operating results warrant. Beginning at the effective date of the new schedule of rates; the company is to render reports monthly to the board showing the operating revenues, operating deductions, excluding general amortization, non-operating income, income deductions and balance available for amortization, dividends and surplus and amount appropriated for general amortization for each succeeding calendar month, with comparison with the figures for the corresponding month of 1917; and the board will retain jurisdiction of the emergency of war surcharges as approved, for the purpose of modifying or abrogating them as and if the conditions change.

California Pledges Power Conservation.

Sacramento, Cal.—Users of electric power, particularly those who use the electricity for agricultural undertakings, have been requested by the federal fuel administration to conserve, and where possible to use the current during night hours only. Pledge cards, similar to those used by the food administration, have been sent out by Albert E. Schwabacher, federal fuel administrator for California, with a request that they be signed and returned. The cards in question request considerable information as to the pumping equipment of consumers, acres irrigated, source of water supply, crops raised, etc. It is explained by the circulars accompanying the pledge cards that in California the principal fuel is oil, and the need of conservation of oil is daily growing more acute. The fact that the hydro-electric source is not now adequate is touched upon, with the explanation that oil is used to generate the current in connection with steam plants. Power companies are now utilizing all facilities during the day hours, but there is an excess of power available between six in the evening and eight in the morning. Industrial plants that are obliged to operate during daylight hours are now using more power than is at present available. Those who sign the cards are pledged:

1. To operate plants only between the hours of 6 p. m. and 8 a. m. insofar as it is possible to do so, avoiding operation between 8 a. m. and 6 p. m.
2. To keep plants in efficient condition, thus avoiding waste of power. The greatest loss generally occurs as a result of
   (a) Improper pump speed for the head pumped against.
   (b) Leakage of air through loose stuffing boxes.
   (c) Loose and slipping belts.
   (d) Improper adjustment of pumps or other equipment.
3. To open transformer switches when plants are not in operation, thus saving power ordinarily wasted as transformer losses.
4. To avoid unnecessary operation of plants.
5. To see that water is not wasted by careless or inefficient distribution.
6. To make every other reasonable effort to conserve power.
7. To co-operate with the power company in this patriotic campaign by calling on its nearest representative for information and advice.

Court Approves Bond Issues for Light Plant.

Loveland, Colo.—Possibility of facing suits for the recovery from their personal bank accounts of about $12,000 of the city money of Loveland, used under their direction in the construction of a tunnel for the Loveland municipal lighting project, passed for a group of Loveland men who were members of the city council in 1914 when the supreme court handed down a decision in the first of the suits of the city of Loveland vs. the Western Light & Power company. The judgment of the lower court in effect put the stamp of its approval on the first of the bond issues authorized by Loveland voters for the purpose of constructing their proposed light plant. The case in which the supreme court rendered its decision was started several years ago, when the power company sought to restrain work on the Loveland project on the ground that the election at which a $79,000 bond issue had been approved was invalid. The issue was attacked on the ground that the amount was $53,000 in excess of the bonding powers of the city. Meanwhile the city council went ahead and spent $12,000 of the general funds of the city on work on the project, and there was some talk among the citizens of Loveland who joined the light company in bringing suit, that if the case went their way in the supreme court they would attempt to make the councilmen who voted for the expenditure of this money, pay the bills. The supreme court, however, has held that the first election and the acts of the council under it were valid. The bonds originally voted have never been issued, for the next state legislature adopted a law which enlarged the bonding ability of Loveland and subsequently an issue for $83,000 was approved. At the present time no work is progressing on the project because of war conditions.

FIRE AND POLICE

Firemen Decide Not to Strike.

Spokane, Wash.—Resolutions asserting the loyalty of their organization to the government and to the city and its people, and giving that as a reason for reconsidering their contemplated action, were adopted at a meeting of the city firemen, at which it was decided not to present the written resignations of 97 of their number because of a refusal of immediate wage increases. This, it is stated, will end the concerted movement started several weeks ago in an endeavor to force the city commissioners to wage increases before next January by threatening a walkout of many of the most experienced firemen. The firemen's demands for an increase of $15 per month were turned down by the city council, which at the same time practically promised increases to the firemen and many other city employes when the 1919 city budget is made up. At the same time, Mayor Fassett expressed the hope that the firemen would demonstrate their loyalty by remaining in their positions in the meantime, because of the difficulty their resignations would present to the city in filling their places with inexperienced men. Plans were being worked out by the city officials to prevent a walkout of any firemen planning on returning to work by making two days' absence from duty without leave the equivalent of a resignation, and it was planned to let down the civil service bars to permit the city to employ men in the open labor market for the fire department.

Difficult Store Blaze.

Pittsburgh, Pa.—Fire caused by two explosions of undetermined origin destroyed three floors of the building occupied by a 5 to 50 cent store in the heart of the business district. A seventy-six-year-old night watchman was seriously injured by the first explosion and afterwards died in the hospital. Two firemen were overcome while fighting the flames, which for a time threatened to spread to the rest of the block. Three alarms were turned in, all of the downtown fire apparatus responding. The loss is estimated at $150,000. For a time the fire got beyond control of the men and a number of adjacent stores were threatened.

Business District Swept By Fire.

Caribou, Me.—Almost the entire business section of this town was destroyed by fire, several business blocks and dwellings being burned, causing damage estimated at $500,000. The fire department was delayed in fighting the flames because of a broken water main. Help had to be summoned from Presque Isle, Washington, Fort Fairfield and Houlton. The apparatus from the latter town arrived on a special train, covering the 61 miles in one hour and 21 minutes. The blaze, starting in the kitchen of a restaurant, spread rapidly. The burned buildings were located on three streets. The cause is unknown. The buildings burned included ten business blocks and two residences. None of the schools or other public buildings situated in that section were destroyed.

Vice Elimination in Toledo.

Toledo, O.—The city's "tenderloin" officially went out of existence recently by mayor Schreiber's order. This was a war-time health measure, requested by military authorities for conservation of man-power. Approximately 1,300 women of the underworld were compelled to leave the city or abandon their method of living. In a formal statement mayor Schreiber explained that the abolition of the tenderloin is not a spasmodic attempt at reform, but is meant to be a permanent re-establishment of the order of things, necessitated by war-time conditions. Safety director Wall instructed police chief Herbert to carry out the clean-up order, and the chief pledged himself to do it thoroughly. The order followed several weeks of government investigation. The order meant the elimination of 38 registered resorts, housing 245 white and 60 colored inmates. Besides these, it was estimated by the police department, there were 700 white and 300 colored immoral women scattered through questionable districts of the city, all known to the police. Health commissioner Dr. C. W. Waggoner states that pending the securing of a municipal hospital for the treatment of the cases that need to be hospitalized the patients are applying for treatment at the city dispensary. Here they are examined, and samples of their discharges and samples of blood are taken for analysis by the city's serologist, Dr. S. S. Hindman. If they are found to have a venereal disease and they need hospital care they are sent out to the county hospital for several weeks of treatment, usually six weeks. This work has been going on quietly for a year or more. The health commissioner expects the number of patients to increase rapidly as soon as the women find out that they will not be permitted to continue their illicit business in other parts of the city, nor in suburban towns. When that time comes he predicts that the city will be swamped with victims of venereal disease who want to be rid of it. To take care of them other buildings will have to be provided. It was to anticipate this coming demand that the commissioner proposed the remodeling of the university science building for use as a contagious disease hospital. The terms on which the building had been purchased made it impossible to be used permanently as a hospital, and it was thought inadvisable to spend the money necessary for remodeling and equipping it when it could only be used for a short time. At present there are several other plans under consideration. One considered most favorably contemplates the lease of a residence formerly used for immoral purposes, and located in the heart of the district. This could be put into condition, says the commissioner, to accommodate forty or fifty patients, the maximum number expected to need hospital care at any one time. The larger number of the patients will be treated outside the hospital. Council has authorized the welfare director to enter into a lease for this purpose. Because there is no method by which persons afflicted with the disease can be compelled to take the treatment provided only those can be cared for who come voluntarily or who are arrested by the police for continuing in the business. Efforts will be made to find positions in the industries for those who do take the treatment and who are cured. Already the co-operation of one large concern has been secured, and others will follow. In order that the women can enter the industries without being branded as social outcasts the bureau of industrial hygiene of the health division is canvassing the factories to get them to require a physical examination of all employees. The health commissioner states that the greater number of venereal infections are not due directly to these women. A universal examination of all the employees will disclose this fact, he says, and will help to prevent the redeemed women of the former vice district from being singled out for derision.

The most effective state law for curbing vice in cities was passed by the last legislature in March, 1917. It declares "places in which lewdness, assignation or prostitution exists to be nuisances," and provides for their abatement. Under its provisions "the attorney-general of the state, the prosecuting attorney of the county, or any person who is a citizen of the county, may bring an action in equity to abate such nuisance and to perpetually enjoin the person or persons maintaining the same from further maintenance thereof." Action can be brought in the common pleas court, and the procedure is described in detail in the act. If the injunction is granted by the court and the place found to be a nuisance of this kind an order of abatement must be entered as a part of the judgment in the case, directing the removal and sale of all the personal property found there. A tax of $300 is to be imposed against the person maintaining the nuisance.

Aid Summoned From Other Towns.

Brownsville, Pa.—The whole of the downtown business district was threatened by a fire which broke out in the basement of 5 and 10-cent store in the Grand Opera House building, a three-story frame structure. The building was destroyed and the loss on it and other buildings is expected to reach $200,000. The Brownsville fire companies were unable to cope with the fire and aid was summoned from Connellsville, Uniontown and other towns. Within a space of ten minutes the fire had spread to a furniture store and drygoods store, which occupied a five-story frame structure to the north, and to a barber shop and a grocery store, which occupied a two-story frame building to the south. A number of firemen were overcome by smoke and had to be carried from the burning buildings.

GOVERNMENT AND FINANCE

City Gets Good Premium on Bond Issue.

Philadelphia, Pa.—A total premium of more than $119,000 was given the city in the high offer for the $5,500,000 bond issue, for which bids were opened recently. The offer was for the entire issue and was submitted jointly by Reilly, Brock & Co. and the First National Bank, of New York, who bid $102,177. Mayor Smith Announced the award of the issue to this combination. Three other bids for the entire issue were submitted, each offering a premium. They were: William A. Read & Co., $102.047; Drexel & Co., Brown Brothers & Co., Harris, Forbes & Co. and the National City Company, of New York, in combination, $101.418, and Montgomery & Co. and the Equitable Trust Company, of New York, $100.89. Altogether thirty-seven bids were received, the loan being between four and five times over-subscribed. Most of the bids were for less than $100,000 and three for less than $500. Twenty-one of the bids named their price at par. One was below par and one was thrown out. The issue of thirty-year bonds bears an interest of 4½ per cent, to which the rate was recently raised by councils. This is the highest rate of interest ever attached to this city's municipal bonds, the previous usual rate having been 4 per cent. Part of the issue, $2,500,000, is for the payment of mandamuses arising from the acquisition of property for public improvements. The remaining $3,000,000 is a part of the general loan of $42,450,800 authorized June, 1916. This is the fifth loan during the administration of mayor Smith. The five total $40,549,000. The last previous loan was for $7,275,700, and was sold by the city treasurer over the counter at par.

Elect Under Old and New Systems at Same Time.

Roanoke, Va.—A double election was held here for five councilmen under the new form of councilmanic-manager government now being contested in the courts, and also for councilmen and aldermen to fill vacancies under the old bicameral system of government in case the new form is declared unconstitutional. In the contest for councilmen under the new form, there were 23 candidates and the contest was heated, but the five men selected as a Citizens' ticket came out with large leads.

Proposes New Comprehensive Pension Plan.

New York, N. Y.—Joseph Haag, secretary of the mayor's commission on pensions, has submitted to the board of estimate a report dealing with the pension problem and proposing to establish a sound retirement plan for all employees entering the city service. The plan is similar to that adopted for teachers. It provides for participation in the cost of the benefits on about equal terms between the city and its employees. It also protects employees at the expense of the city against all accidents and disabilities arising as the result of the performance of duty. Mayor Hylan is said to favor the plan. Mr. Haag declares that unless legislation proposed in his report is adopted "the city will shortly be struggling under a budget item of approximately $18,000,000 a year for pensions alone, even though the thousands of clerks, laborers and mechanics in the city service are not adequately covered by pension benefits." Provision has been made in the bill that any present employee who prefers the advantage offered by the new system may elect to enter it and to discontinue his connection with the old pension fund. Some features of the proposed plan follow: Retirement allowances averaging one-half pay are provided on the attainment of certain ages, varying from age 55 to 62, according to the employee's occupation; but if they remain in service they receive proportionally increased allowances. Allowances are provided to employees disabled after ten years of service. These allowances vary from 25 per cent. to approximately half pay, depending upon the length of service. If disability is the result of the performance of duty a pension is allowable, regardless of length of service. Three-quarters pay is allowed as a minimum in such cases. Employees dying in service are to be covered by insurance benefits provided by the city, and their families are to receive all of the employee's contributions with interest. If the employee's death is the result of performance of duty his widow and children are covered by half-pay pensions, and in addition his contributions are repaid to them with interest. The majority of entrants will contribute about 4 per cent. of their salaries. If they resign or if they are dismissed they are to receive back their contributions with interest.

TRAFFIC AND TRANSPORTATION

City Car Line Raises Fares.

Edmonton, Alta.—The Radial Railway, operated by the city, has instituted new rates, the cash fare being increased to 7 cents till 11 p. m. After that hour the rate is 10 cents. The revised rates fixed by the council are as follows: Tickets purchased off the cars at ticket-selling stations, five for 25 cents; tickets bought on the cars, four for 25 cents. No workmen's tickets are now issued. Children under six years of age are carried free. Tickets for children more than six and under fifteen years of age, and high school pupils carrying certificates, ten for 25 cents, or one-half fare. Children carried after 11 p. m. pay half fare. Between 5 and 6:30 p. m. 5 cents is charged on baby carriages and large parcels. No change has been made regarding transfers.

Commission Has No Power to Require Amortization.

New York, N. Y.—According to a decision by the state court of appeals, the public service commission for the First District has no authority to require an electric railway to reserve a definite percentage of its revenues for maintenance and depreciation. This is the result of a legal fight started following such an order in February, 1912, in connection with the reorganization of the old Metropolitan Street Railway in New York City. The successor company, the New York Railways, was required, before paying any interest on its income bonds or dividends on its stock, to set aside each month 20 per cent of its gross operating revenue for maintenance and depreciation and, if this was not expended during the month, to credit the unexpected amount to an account called "accrued amortization of capital." The company objected to the order on the grounds that the commission was without power to make it; that the required reservation was not always needed in full for the purposes designated and that the directors were the proper persons to determine the depreciation rate and amount of reserve. Last January the appellate division of the supreme court in certiorari proceedings affirmed the order, with the finding that the regulatory law had conferred full power upon the commission to regulate the methods of public service corporations. This decision of the lower court, however, has now been reversed by the highest court in the state, the court of appeals. The opinion of this court states that the commission bases its authority to make the order upon section 52 of the public service commission act, which provides for the establishment of a system of accounts. In regard to this the court, with the unanimous approval of the six judges sitting on the case, says:

> Section 52 was plainly intended to make the method of accounting by these corporations uniform so that the accounts could be readily comprehended by those required to examine the same. By establishing a system of accounts the corporations were required to show under particular heads what they had done. It was not to regulate the management of their finances, but to show what the management was.
>
> The other sections of the act clearly do not in express terms authorize the commission to require the creation of a reserve fund to renew the plant when the same shall be worn out or shall become obsolete. It is not pretended by anyone that they do.
>
> The power of the Public Service Commission is extensive, and the act creating the commission should be construed in the same spirit in which it was enacted. Still, when a particular power is exercised by the commission or is claimed for it, that power should have its basis in the language of the statute or should be necessarily implied therefrom. The assertion of authority under review here is outside and beyond the statute.
>
> The decision in Quinby vs. Public Service Commission (223 N. Y. 244) is controlling here, and requires us to hold that the Public Service Commission had no authority to make the order requiring the company to reserve 20 per cent of its gross operating revenue for maintenance and depreciation and for the creation of the amortization of capital account.

As of June 30, 1917, the account for "accrued amortization of capital" amounted to $3,127,258, equivalent to more than 10 per cent on the outstanding adjustment income 5 per cent bonds. Although interest on these bonds is non-cumulative, the bondholders assert that the fund should be distributed among them. No interest payment on these securities has been made since 1916.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

June 21, 22.—NEW JERSEY ASSOCIATION OF COUNTY ENGINEERS. Annual meeting, Mt. Holly and Toms River, N. J. Secretary, T. J. Wasser, Jersey City, N. J.

June 24-26.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 25-28.—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 26-28.—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual meeting, Northwestern University, Evanston, Ill.

June 26-28.—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention, Atlantic City, N. J. Secretary, F. L. Hutchinson, 33 West 39th St., New York City

July 10-12.—OHIO ELECTRIC LIGHT ASSOCIATION. Twenty-fourth annual convention, Breakers Hotel, Cedar Point, O Secretary, D. L. Gaskill, Greenville, O.

Aug. 27-29.—LEAGUE OF CITIES OF THIRD CLASS IN PENNSYLVANIA. Nineteenth annual meeting, Erie, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Oct. 2-4.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual meeting, Buffalo, N. Y. Secretary, Charles Carroll Brown, 304 E. Walnut St., Bloomington, Ill.

American Concrete Institute.

The following program has been announced for the annual convention of the American Concrete Institute as postponed from the original date in February at Chicago, when traffic conditions made the postponement advisable. The expected attendance of many members of the Concrete Institute at the annual meeting of the American Society for Testing Materials at Atlantic City, June 25-28, and the portions of the concrete field occupied by this society and the Concrete Institute in common suggested June 27-29 and Atlantic City for the convention of the latter. Through the courteous co-operation of the officers of the American Society for Testing Materials, through Dr. Edgar Marburg, secretary, the headquarters of both the American Society for Testing Materials and the Concrete Institute will be at the Hotel Traymore, and a joint session will be held on Thursday, June 27, 8 p. m. On account of the limited time available for the full program no provision has been made for recess for recreation.

Thursday, June 27, 8 p. m.—Joint Session with American Society for Testing Materials. Report of A. S. T. M. Committee C-1, "On Cement," R. S. Greenman, chairman; Report of A. S. T. M. Committee C-2, "On Reinforced Concrete," F. E. Turneaure, chairman; Report of A. C. I. Committee on "Treatment of Concrete Surfaces," J. C. Pearson, chairman; "Tests of Stucco," J. C. Pearson (A. C. I. paper); "Tests of Concrete Columns," W. A. Hull (A. C. I. paper); "Effect of Age on the Strength of Concrete," D. A. Abrams (A. S. T. M. paper); "Proportioning the Materials of Mortars and Concretes by Surface Areas of Aggregates," L. N. Edwards (A. S. T. M. paper).

Friday, 10 a. m.—Concrete Properties and Products. Report of the Sub-Committee on "Research," W. A. Slater, chairman; "Apparatus for Testing Under Uniform Load," H. H. Schofield; "Plasticity and Temperature Deformations in Concrete," S. C. Hollister; Report of Committee on "Building Blocks," R. F. Havlik, chairman; "Concrete in Art Work," R. F. Havlik; "Problems in Concrete Surfaces," J. J. Earley; "Reinforced Concrete for Railway Purposes," Charles Gilman.

Friday, 3 p. m.—Design and Tests. Report of Committee on "Far Rockaway Fire," Richard L. Humphrey, chairman; Report of Committee on "Reinforced Concrete and Building Laws," E. J. Moore, chairman; "Moment Coefficients in Flat-Slab Design," W. K. Hatt; "Tests of Western Newspaper Building," A. N. Talbot and H. F. Gonnerman; "Theory and Test of Flat Slab with Ring Reinforcement," Edward Smulski; Report of Committee on "Concrete Chimneys," L. R. Cobb, chairman; "Design of Concrete Chimneys," J. G. Mingle.

Friday, 8 p. m.—Concrete Houses. Report of Committee on "Industrial Concrete Housing," L. H. Allen, chairman; "Industrial Housing and Labor Turnover," L. H. Allen; "Advantages and Disadvantages," J. E. Conzelman; "Examples," A. B. Whipple; "Methods of Construction of Concrete Houses," K. H. Talbot; "Architectural Design of Concrete Houses," Emile G. Perrot; "Interior Design of Concrete Houses," M. D. Morrill.

Saturday, 10 a. m.—Concrete Roads and Pavements. Report of Committee on "Roads and Pavements"; "Concrete Roadways for the Industrial Plant," G. S. Eaton; Report of Committee on "Sidewalks and Floors"; "Effect of Time of Mixing on the Strength and Wearing Qualities of Concrete," D. A. Abrams; "Distortions and Vertical Changes of Concrete Pavement Slabs Due to Subgrade Movements," J. W. Lowell; "Surface Requirements for Concrete Roads," A. H. Hunter; "Progress in Concrete Pavement Design and Construction at Winnetka, Illinois," F. A. Windes; "Concrete Road Construction in Vermilion County, Illinois," P. C. McArdle; Report of Committee on "Concrete Sewers."

Saturday, 3 p. m.—Structures and Buildings. "Reinforced Concrete Columns Under Eccentric Load," L. J. Mensch; "Cold Storage Buildings of Concrete," G. H. Brazer; "Core Construction," A. H. Bromley, Jr.; "Relation of Costs to Design of Reinforced Concrete Buildings," C. W. Mayers; "Construction of C. & N. W. Railway Grain Elevator," C. F. Huffman; "Construction of Reinforced Concrete Building for American Can Co," N. M. Loney; Report of Committee on "High-

(Continued on page 520.)

PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Preston County, Kingwood, W. Va., is to build a brick ROAD. The engineer for the improvement is E. Smith.

Extensions to its WATER WORKS are to be made by Clay Center, Neb. Plans and specifications were prepared by Charles F. Sturtevant.

Ontario, Canada, in making improvements at the William Head, B. C., QUARANTINE STATION, has the engineering services of the firm of Chipman & Power.

STREET IMPROVEMENTS are to be made by Washburn, Wis. The consulting engineering firm of Reichardt & Pierce has prepared plans and specifications for the work.

WATERWORKS and SANITARY SEWERAGE SYSTEM are to be built by Fountain Inn, S. C. The consulting engineer for the improvements is J. N. Ambler.

Ogdensburg, N. Y., is to improve a CANAL by widening, constructing retaining walls and drainage facilities. Plans for the improvements were prepared by the Hydraulic Construction Company.

Carroll County, Vaiden, Miss., is to construct thirty miles of ROADS. The consulting engineer for the improvement is W. C. Stowell.

STREET IMPROVEMENTS are to be made by Cooper, Tex. The consulting engineer for the work is Henry Exall Elrod.

Elmhurst, Ill., is to build a SEWAGE DISPOSAL PLANT. Plans and specifications for the works were prepared by the consulting engineer, Edwin Hancock.

Leamington, Ont., is to construct a RESERVOIR for its water supply. Plans and specifications for the work were prepared by the consulting engineer, J. J. Newman.

Pottawattamie County, Council Bluffs, Ia., is STRAIGHTENING the channel of a RIVER. The engineers for the project are the firm of Price & McCormack.

The Adrian Water Co., Adrian, Mich., is to extend its WATER SUPPLY SYSTEM, including adding of new pumping machinery. The consulting engineer for the improvement is A. H. Smith.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

HIGH DRUM "NON-TIP" PAVER.

"Boss" Lincoln Highway Mixer of Improved Design.

The new "Lincoln Highway" pavers are the latest developments in the "Boss" line of concrete mixers. They are especially designed for a wide range of work and emphasis is placed on greater lightness and greater strength. Economy of operation, in costs, labor and time, is the important feature of the new paver.

One valuable quality of the construction is the "non-tip" safeguard. The danger of tipping is eliminated by the unusually wide track and wide tires. The pavers are all built with high drums, the bottom of the discharge spoon being six feet from the ground.

The capacity of the paver is 14 ft. unmixed or 10 ft. mixed concrete, and is designed to lay 87 street yards per hour, based on one minute mixing time. It has the Boss patented high speed mixing and discharging action, doing the work with fewer revolutions than are necessary in other types.

The chute is sectional and pivoted. It may be raised or lowered by a powerful winch. The three gates allow dumping concrete right up to the paver. This chute is particularly economical, as it saves unnecessary moving. The high drum gives steep pitch to the chute, which is 14 ft. long and swings from curb to curb.

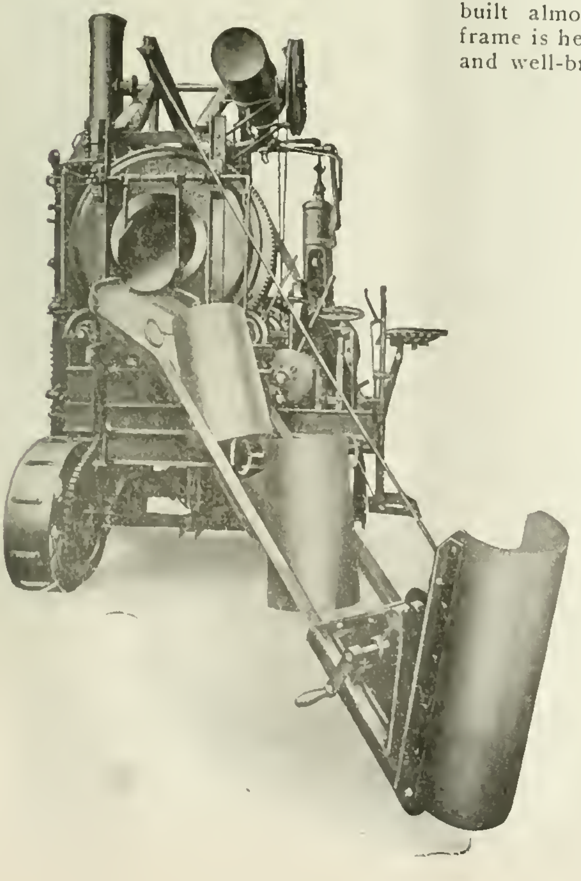
The automatic loading hopper is of the two-man charging type, with an equalizing cable arrangement. It stops automatically and throws a brake at unloading position. It has a steep pitch and big, non-choking throat. It is built heavily reinforced. It has a special measuring pressure water tank, the valve of which can be set for uniform batches. A special non-leak three-way valve is also used. The tank is tested for 125 pounds pressure and is electric welded. It is under one-lever control.

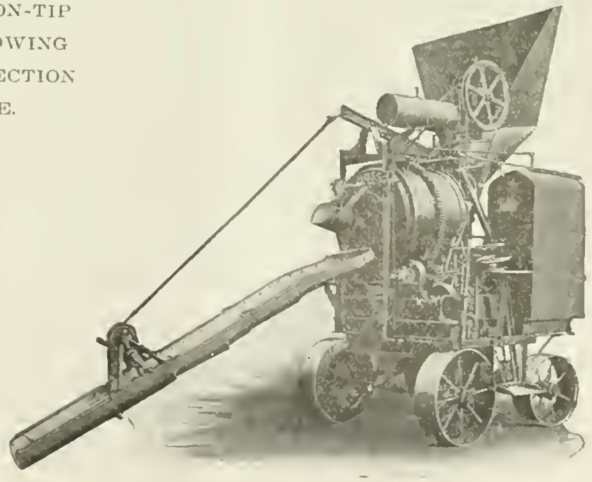
Eight horse-power "Novo" or "Ideal" gasoline or "Novo" kerosene engines are furnished—with high tension magnetos—frost and dust proof. Steam or electric power may be had if preferred. The clutches are of the powerful toggle type, easily adjusted. The massive drum gear is chilled semi-steel, all gears being over-sized. The traction chains are of 30,000 lb. strain union steel; the transmission chain being case-hardened steel, roller type.

The machine has two-way traction—machine-cut traction or reversing gears; geared low for slow speed and big surplus power. The machine is built almost entirely of steel. The frame is heavy 7-inch steel, hot riveted and well-braced. The front axle is 3-inch steel; the rear is 5x5 and the wheels are high and heavy.

Another important feature is the one-man control. All levers are banked within reach of the operator. A "built-in" hoist may be used to pull straight edge or leveling board, thus saving one man's time back of paver.

The Lincoln highway paver, two views of which are shown in the accompanying illustrations, is made by the American Cement Machine Co., Keokuk, Ia., makers of the well-known line of mixers, grouters, hoists, pumps, backfillers, material elevators and concrete carts.





"BOSS" LINCOLN HIGHWAY PAVER, NON-TIP TYPE, SHOWING THREE-SECTION CHUTE.

INDUSTRIAL NEWS

Government Takes Over Steel and Iron Supply.

Following recent conferences, the War Industries Board and the American Iron and Steel Institute have effected an agreement by which Director of Steel Supply J. L. Replogle practically assumes control over the distribution of iron and steel. The supply is to be distributed to plants manufacturing war materials first; then to producers of so-called "essential" products named in the current preference list of the priorities committee, and then, if there remains a surplus, to other consumers officially approved. The agreement says that study of the situation has disclosed the necessity for: "(1) A strict conservation of the available supply of iron and steel products, on the one hand, and (2) the expansion of existing sources and development of new sources of supply of iron and steel products, on the other hand." No pig iron or steel manufactured products will be shipped or delivered, except as follows: (1) By priority certificates issued by the Priorities Division of the War Industries Board; or (2) after priority certificates shall have been issued for or filled, then producers of pig iron and of steel manufactured products may utilize such raw materials and manufacturing capacity, if any, as they may have available, to fill orders of their customers not covered by priority certificates, provided such orders are embraced within the schedule of purpose entitled to preference treatment as determined by the Priorities Board as follows:

Ships.—Including destroyers and submarine chasers.

Aircraft.

Munitions, military and naval supplies and operations.—Building construction for Government needs. Equipment for same.

Fuel.—Domestic consumption. Manufacturing necessities named herein.

Foodstuffs for human consumption and plants handling same.

Feeding stuffs for domestic fowls and animals, and plants handling same.

Food and collateral industries.—All tools, utensils, implements, machinery, and equipment required for production, harvesting and distribution, milling, preparing, canning and refining foods and feeds such as seeds of foods and feeds, binder twine, etc.

Products of collateral industries, such as fertilizer, fertilizer ingredients, insecticides and fungicides.

Containers for foods and feeds, collateral products.

Materials and equipment for preservation of foods and feeds, such as ammonia and other refrigeration supplies, including ice.

Clothing.—For civilian population.

Railroad.—Or other necessary transportation equipment, including water transportation.

Public utilities.—Serving war industries, army, navy, and civilian population.

Including all necessary raw materials, partially manufactured parts, and supplies for completion of products.

Whenever the Priorities Board shall have promulgated and certified for observance to the producers of pig iron and steel manufactured products, a revised preference list, no surplus material or capacity after filling or providing for all orders covered by priority certificates shall be used to fill non-priority orders save such as are placed by industries or plants embraced within such preference list.

Each producer of pig iron and of steel manufactured products shall at the end of each week, ending with midnight Saturday thereof, prepare and forward to the Director of Steel Supply of the War Industries Board a detailed statement of all shipments made during such week not covered by priority certificates.

Should any producer of pig iron or of steel manufactured products have any surplus war material or manufacturing capacity after filling (a) all orders covered by priority certificates and (b) all orders embraced within the schedule of purposes entitled to preference treatment or placed by industries or plants embraced within the revised preference list, after it shall have been promulgated and certified by the Priorities Board, then in such event such surplus materials or capacity may be disposed of by such producer or manufacturer to other customers subject to the approval in writing of the director of steel supply first had and obtained.

The director of steel supply and a committee appointed by the American Iron and Steel Institute shall jointly make a careful study of the present and prospective iron and steel requirements of each and every department and agency of the Government of the United States and of its Allies, and the capacity of the iron-producing and steel-manufacturing plants of the United States to meet such requirements and present to this board as early as practicable (1) a report of their findings, together with (2) recommendations of measures, if any, which should be taken to stimulate and increase the production of iron and of iron and steel products in order to meet the direct and indirect war requirements and the demands of industries of exceptional or national importance.

In view of the estimate that the Government will require at least 85 per cent of the total output of the industry for strictly war purposes, it is doubtful whether there will be a surplus after all allocations have been made to plants included in the preference list; but the officials of the board are inclined to the opinion that while there may not always be a margin there will be from time to time considerable quantities of iron and steel for general consumption and the board pledges itself to adopt every possible method to reduce to a minimum the hardship suffered by the non-essential industries. Steps will be taken immediately to increase the output of the iron and steel industry in the most practicable manner. It is probable, in the opinion of the Director of Steel Supply and other members of the board, that occasions will arise when it will be impossible to supply even the plants included in the preference list with 100 per cent of their needs, but in seeking to do so pig iron and all forms of semi-finished steel will be transferred from the plant of one consumer to that of another wherever necessary, due regard being given to the avoidance of hardship. In dealing with all the industries of the country, including the automobile manufacturers, the Government will constantly keep in mind the competitive situation both at present and as it may exist at the end of the war. Allowances of material for non-essential purposes will be made with the principle of equity constantly in view and no single manufacturer in any trade will be allowed advantages which his competitors do not enjoy.

Cast Iron Pipe.—Pipe manufacturers are still uncertain as to the effect of the resolutions adopted by the War Industries Board in regard to the distribution of iron and steel products. Cast-iron pipe is not put on a preferential list, as had been hoped, but manufacturers believe that they will be allowed to receive pig iron for use in making pipe and fittings for Government work, which is at present a large part of their business. The new Government prices announced recently are now being quoted. Quotations: Chicago: 4-inch, $63.35; 6-inch and larger, $60.35; Class A $1 extra. Birmingham: 4-inch, $58; 6-inch and larger, $55; Class A $1 extra. New York: 4-inch, $64.35; 6-inch and larger, $61.35; Class A $1 extra.

Hydroelectric Scheme in India.—The government of Madras has accepted the proposal of the chief engineer of a combined water supply and hydroelectric scheme from the Sriveni River for supplying Coimbatore and Podanur, South India, with water and electric power, the cost of which amounts to approximately $1,329,377. Persons interested should address the chief engineer, Public Works Department, Government of Madras, Madras, India.

NEWS OF THE SOCIETIES

(*Continued on page* 518.)

way and Culverts"; "Flat-Slab Railway Bridges," A. B. Cohen.

Saturday, 8 p. m.—Reinforced Concrete Barges and Ships. Report of Committee on "Nomenclature," W. A. Slater, chairman; Report of Committee on "Concrete Barges and Ships," H. C. Turner, chairman; "Principles of Design of Concrete Ships," R. J. Wig and S. C. Hollister; "Illustrated Paper on Concrete Ships," J. E. Freeman; "Concrete Ships," Archibald G. Monks; "Concrete Barges," O. F. Lackey. Several other papers on concrete ships are expected, but not yet authorized to be announced. A film will be shown of the launching of the 4,500-ton ship "Faith" at San Francisco.

Annual Conference of Health Officers.

The sixteenth annual conference of State and Territorial Health Authorities with the United States Public Health Service was held in Washington, D. C., June 3 and 4.

Following opening remarks by the surgeon general, the roll call of delegates, and the appointment of committees the following committee presented their reports: "Matters Related to War," Dr. H. M. Biggs; "Morbidity Returns," Dr. A. J. Chesley; "Sanitation of Public Conveyances," Dr. Oscar Dowling; "Rural Sanitation," Dr. W. S. Rankin; "Trachoma," Dr. A. W. Freeman; "Increasing Efficiency of Conferences," Dr. W. C. Woodward.

The following subjects were discussed as new business: Sanitation of extra cantonment areas, especially as related to the work of state and local health authorities. The venereal diseases: Their control, with reference to the relation of the United States Public Health Service to state and cities in handling this problem. Better control of communicable diseases and disease carriers, especially in the case of cerebrospinal meningitis and typhoid fever. Use of records of drafted men for public health purposes. Relation to public health of industrial hygiene and sanitation, especially in war industries. Care of health of tuberculous soldiers and relation to the public health, especially after their return to civil life. Trachoma and its bearing on the public health of the military forces. Hookworm disease: The importance of its prevalence and control among the military forces. Effects on the public health of the forthcoming shortage in the medical profession. Better morbidity reports: How to secure them. (a) Fees to physicians; (b) appointments of collaborating epidemiologists in every state and assistant collaborating epidemiologists in every county; (c) issuance of weekly bulletins containing detailed summaries of reports from 100 representative cities; (d) creation of registration area. Railroad water supplies. Pellagra.

Municipal Journal

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THE LEGAL STATUS OF STREAM POLLUTION

Digest of Judicial Decisions, Interpreting Both Common Law and Enactments of State Legislatures—Drainage of Surface Water—Discharge Into Streams of Sewage and Manufacturing Wastes—Joint Action and Responsibility.

The United States Public Health Service has just issued a bulletin giving a digest of judicial decisions concerning stream pollution and a compilation of legislation relating to the subject, which bulletin was prepared by Stanley D. Montgomery and Prof. Earle B. Phelps. This brings the legislation practically to date, in that it includes laws in force at the end of the 1917 sessions of the various state legislatures, except that the 1917 laws were not available for Alabama, Arkansas, District of Columbia, Florida, Pennsylvania, Indiana, Iowa, Kansas, Kentucky, Mississippi, Nebraska, Oklahoma, the Philippines, Rhode Island, Vermont, Virginia and Wisconsin; several of which states, however, had had no legislatures in session since 1915. This digest should prove of the greatest service to all who are interested or who may in the future become interested in the matter of the pollution of streams by sewage and in other engineering matters involving stream pollution, as well as to those who may wish to draw up laws, municipal, state or federal, relative to stream pollution.

In making this study, it was found necessary to ascertain the precise status of legislation relating to the pollution of streams and other water supplies, inasmuch as the whole subject of the control of stream pollution is bound up with the limitations imposed by common law and statute. Although knowledge of the laws themselves was required, even more important was a knowledge of court decisions and an analysis of the trend of these decisions. The court decisions are numerous and in fact, until recent years, when the states began enacting specific legislation on the subject, the rights of riparian owners were enforced by court decisions interpreting the provisions of the common law. Even now it is to these decisions more than to the law itself that one must turn for an understanding of how the problem is being met from a legal point of view. For these reasons, the first and more important part of this bulletin is devoted to a digest of court decisions, although the more voluminous portion which supplements this comprises a compilation of all of the state laws and health regulations that seem closely related to the subject of pollution of streams.

The digest of judicial decisions is excellently arranged typographically, three classes of type being used, black faced type for the statements of the essential principles contained in various digests, a less conspicuous type for explaining and amplifying these statements, while the smallest size of type is used for quotations of portions of the digests themselves. The bulletin should be obtained by all who are interested in the subject (it is for sale by the Superintendent of Documents at Washington at 30c per copy), but a general statement of the various principles, as conveyed by the black-faced type, is given below for general information.

The basic rule of the common law has been stated to be that each riparian proprietor has the right to have the stream come down to him with its quality unimpaired and with its quantity undiminished. However, from the fact that each riparian proprietor has a dual interest in the stream, it logically and necessarily results that each riparian proprietor is permitted to make of the stream a reasonable use and no more; and the true rule may be stated to be that each riparian proprietor has the right to have the stream flow through or past his land with its quality unimpaired and its quantity undiminished, except in such manner and to such extent as may result from a reasonable use of the stream by riparian proprietors above him. The courts have generally favored those uses of a stream that may be classed as natural, such as domestic use, watering of cattle, etc., as distinguished from artificial uses like manufacturing. But although a use may be classed as a natural one, if it be exercised immoderately or excessively it becomes unreasonable and illegal.

Ordinarily the drainage of surface water cannot be made the ground of complaint even though it causes injury to a lower riparian proprietor. According to a New York decision: "The owner of lands drained by a watercourse may change and control the natural flow of the surface water thereon, and by ditches or otherwise accelerate the flow or increase the volume of water which reaches the stream, and if he does this in the reasonable use of his premises, he exercises only a legal right and incurs no liability to a lower proprietor." But one draining the surface water into a natural stream will not be permitted to cause the capacity of the stream to be exceeded so as to overflow to the injury of a lower riparian proprietor. Moreover, while the riparian proprietor may accelerate the runoff of surface water into a natural stream, he will not be permitted to divert it from its natural course.

Discharging waste from a manufacturing plant or mine into a stream is not a natural use of a stream and if done to the material injury of the lower riparian proprietor, creates a liability for damages. (Several qualifications of this statement are referred to in the bulletin as made by the state courts.) The fact that a manufacturer is engaged in an important industry, the operation of which benefits the public, will not be held to excuse him for polluting the stream to the injury of the lower proprietor. It has been held that even where a lower proprietor can, at comparatively small expense, protect himself against the injury caused by an upper proprietor engaged in an important business, he is not bound to do so. The courts of Pennsylvania and Indiana have adhered to doctrines as to mining that are expressly repudiated elsewhere, these states holding that mine operators have a right to pollute streams by pumping into them water from their mines.

It has been held that evidence of the custom of the region in which the stream is located may be relevant as bearing upon reasonableness of a given use, but several courts have held that evidence of custom cannot be relevant. Courts have, however, intimated that new and unusual uses of streams will be regarded more jealously than common or customary ones.

The fact that others than the defendant or even the plaintiff himself are polluting the same stream will not excuse the defendant, but evidence that others than the defendant have contributed to the pollution of a stream is admissible for the purpose of showing that not all the damage sustained by the plaintiff was caused by the defendant. Where a stream has been polluted from various causes for longer than a prescriptive period to such an extent that it has become a common sewer, the right to pollute it cannot be challenged.

When a stream is polluted by an upper riparian owner in an unreasonable use or to an unreasonable extent, any lower riparian proprietor who is injured thereby has a right of action at common law for the actual damages sustained by him. It is improper, in an action for damages, for several riparian proprietors to join as plaintiffs. Each should sue separately for the damages he has sustained. Also it has been held to be improper to join several defendants in an action for damages arising from the pollution of a stream to which the various defendants contributed independently. There are, however, some decisions to the contrary, the reasoning being that it is impossible to separate the injury done by the several contributors and that to deny their joint liability is to leave the lower proprietor without remedy for the injury he has sustained. Where the cause of injury to a stream has been maintained by succeeding proprietors, the lower proprietor will not be permitted to join them in an action for damages but must sue each separately.

An unreasonable use of a stream which pollutes it to the injury of a lower riparian proprietor will be enjoined, and several who contribute individually to the pollution of the same stream may be joined as defendants in one suit for an injunction, and several individuals who are injured by the pollution of the same stream may join in an action for an injunction. To entitle a riparian owner to an injunction against polluting a stream, the injury of which he complains must be real and material. But although the injury to the stream must be real in order to entitle the plaintiff to injunctive relief, it does not follow that the plaintiff must have suffered any actual damage in his present use of the stream. In suits for injunction against pollution of streams, the general rule that a nuisance will not be enjoined in an equity suit until its existence has first been established in an action at law does not obtain, the reason being that the delay incident to the establishing of the right in an action at law might cause irreparable injury.

Where the effect produced by the pollution of a stream amounts to a public nuisance, the state by its attorney general may bring an action for an injunction against the continuance of the pollution. As against a lower riparian proprietor, a right to pollute a stream may be acquired by prescription; but where a right by prescription is acquired, it is limited by the use actually made during the entire statutory period. However, a right to create a public nuisance can not be acquired even by prescription, nor can a right by prescription be acquired that will authorize the doing of anything forbidden by statute.

By the great weight of authority, municipalities have no greater rights than individuals to pollute water courses and must respond in damages for any injury caused to a lower riparian proprietor, and may be enjoined from continuing the pollution. A municipality is not liable for the pollution of a stream caused by the ordinary drainage of surface water, but where a city alters the natural course of drainage and causes material increase in the quantity of the flow in a given direction and material injury results, the city is liable for the injury. Also, a city will not be permitted to build artificial drains and thereby conduct surface water into a stream in such quantities as to exceed the capacity of the stream and cause the same to overflow to the injury of a lower proprietor. At common law a city seeking to maintain the purity of a stream, as a lower riparian proprietor, has no greater right than an individual to limit the use of a stream by upper proprietors.

The above relates to judicial decisions relative to the basic rule of common law. Riparian rights have, however, been altered in varying degrees by statutes enacted in the several states, these dealing chiefly with the discharge of sewage into streams. The increase of population has made more urgent the problem of disposing of the increased quantities of sewage, while on the other hand, this increased quantity both of sewage and of factory waste, polluting the stream to such an extent as to destroy fish life and render the water unfit for domestic use and greatly curtail the quantity available for public use, has required that some limitations be placed on the character and quantity of sewage and waste that is permitted to enter the streams. Also, the legislation naturally reflects the advance in the science of bacteriology and the improvements made in sewage purification. It, therefore, becomes apparent that the state, like the individual riparian proprietor, has a dual interest in the stream; on the one hand, the necessity for using it to receive the drainage of cities, and on the other hand that of safeguarding the health of its citizens and protecting the public water supplies.

To protect its streams against pollution, a state may, without providing compensation, curtail the rights of the riparian owner in his use of the stream, according to the weight of authority. Even though a riparian owner may have acquired a right by prescription as against lower proprietors on the stream to pollute the same, he is nevertheless amenable to legislation enacted under the police power for the preservation of the purity of the stream, and can not claim compensation unless the same is provided for in the legislation. Such legislation is not rendered invalid by the fact that it is made applicable to a portion of the state only, provided no unreasonable or arbitrary classification be adopted. Most courts construe strictly statutes for this purpose and hold that such construction does not render them unconstitutional. Some courts have held that statutes enacted for the preservation of streams should be liberally construed in favor of the riparian owner. A state may leave to a commission or board the details of legislation for protection of its waters.

While the powers of the state to prevent pollution have been held to be very broad, the power of the state to authorize the discharge of sewage into streams to the injury of lower proprietors is limited by constitutional provisions. By the great weight of authority, statutes will not be construed as authorizing municipalities to create nuisances by the discharge of sewage, even in those jurisdictions where the constitutional inhibition does not obtain.

As before stated, the above principles are in each case followed by quotations from decisions of various courts, and many qualifications of the general principles are found in the digest, it being the general rule that a decision made in a given state is adhered to by the courts of that state in all later decisions. Consequently, in studying the status of any particular point for a given locality, it is desirable to refer to the decisions upon that point which have been rendered by the courts of the state in question. This bulletin, in connection with the principles above stated, has cited, by longer or shorter quotations, 710 cases from the various states of the country, some individual cases being cited in connection with six or eight different points or principles.

CITY PLANNING FOR DAVENPORT

Recommendations Concerning Street Widths, Sizes of Blocks, Set-Back Lines, Building Zones and Excess Condemnation—Some Detail Plans.

In February, 1917, the City Council of Davenport, Iowa, directed the city engineer, Roscoe E. Sawistowsky, to "prepare a comprehensive plan for the orderly development and extension of the street system" of that city, including therein recommendations concerning development of land tracts, sizes of lots, building lines, districting and "other matters pertinent to such plan." The report containing these matters was presented about a year later and has been published in pamphlet form.

An introductory quotation from Charles W. Elliot represents the ruling idea in preparing this city planning report: "Good planning for cities and closely built towns and villages is not primarily a matter of aesthetics but of economics." In the report itself the author says: "Many plans for cities have miscarried and failed of accomplishment because of their impracticability. The first consideration in city planning should be economic, and then the aesthetic; not the reverse, as has been the case in many elaborate plans prepared for other cities, wholly impossible of accomplishment from the economic standpoint." (The writer believes that fully half of the reports on city planning that have been prepared and elaborately published at great expense during the past fifteen years have not been and never will be carried out, but have on the contrary made the taxpayers and average citizens suspicious of anything bearing the name of city planning.)

THE STREET SYSTEM.

Beginning with the idea that the first thought should be the laying out of the city so as to save time and money to the citizens and property owners and increase the convenience, comfort, speed and economy with which they can go from their homes to places of business or recreation, he presents the advantages of a few diagonal streets wisely located, of adjusting street widths to the relative demands, and of adopting sizes of blocks with a view to health, comfort and the elimination of undesired or improperly used areas of building plots. The principles and arguments presented make no claim for originality, but are undoubtedly new to the majority of average citizens although it is of the greatest importance that they should know and appreciate them.

As general standards (to be modified by circumstances in individual cases), Mr. Sawistowsky recommends as widths for three general classes of streets:

For Main Thoroughfares or Trafficways.

Double street car tracks	20 feet
4 lines of vehicles, 2 on each side of the tracks, 9 feet each	36 "
12 lines of pedestrians, 6 on either sidewalk, 2 feet each	24 "
Total	80 "

Secondary Thoroughfares.

Single car track	8 feet
4 lines of vehicles, 2 on either side of track, 8 feet each	32 "
8-foot sidewalk and 2-foot grass space on each side	20 "
Total	60 "

Residential Streets (Minor).

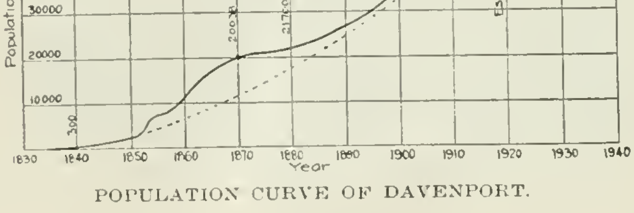
3 lines of vehicles, 8 feet each	24 feet
13-foot boulevard on each side, including sidewalks	26 "
Total	50 "

With these general ideas as a basis, a street plan was prepared for a considerable territory lying north, northwest and north-east of the present city limits as well as for some small undeveloped areas within such limits. Within the city there is proposed the cutting through of one long diagonal street about 1½ miles long and a few minor street extensions, adjustments and widenings. Aside from a few diagonals, the new street lay-out is largely rectangular, except that in the northern part, where the ground is cut up by ravines, an irregular layout is made adapted to the topography.

"There are several large draws, or ravines, draining from the north to Duck creek. There is running water in them practically the year 'round, and to destroy this natural scenic beauty by the construction of large and costly storm drains would be unwise. Main traffic streets are proposed in these draws, providing easy grades for all vehicles and the maximum development of the land for residential purposes.

"One of the prettiest examples of this type of development is the Country Club district of Kansas City. The creek lies to one side of the paving and is spanned by small foot bridges for pedestrians and at all street intersections by artistic concrete or stone arch bridges."

If the street layout proposed for the new territory is adopted by the city council, any street through this section will have to be located as on this plan, and the

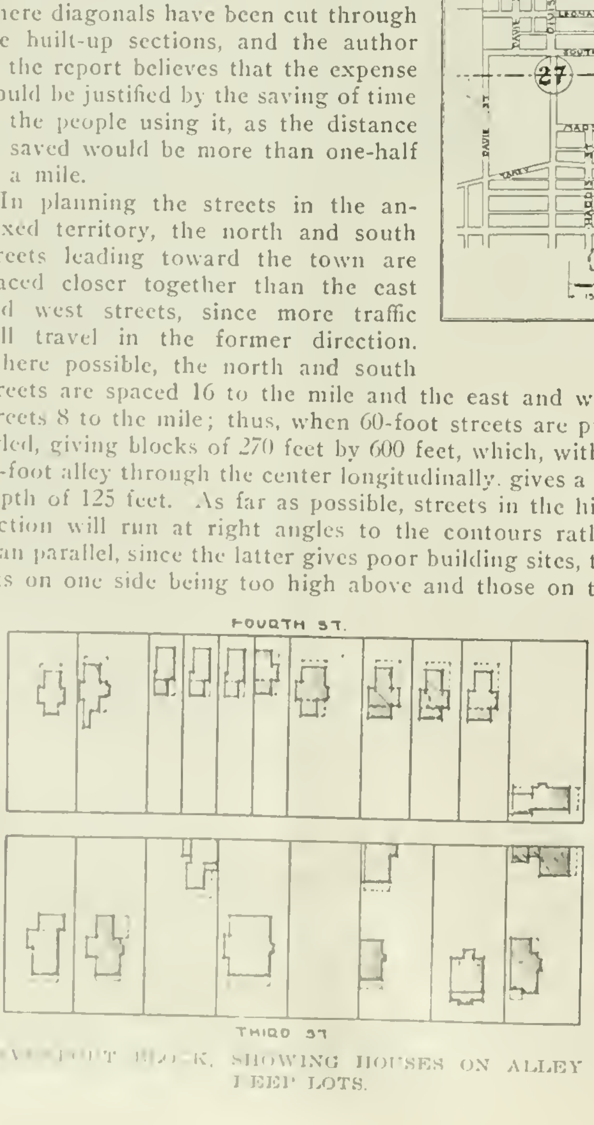


POPULATION CURVE OF DAVENPORT.

council can then demand that the streets and alleys be graded to the established grade before accepting them, which alone would save the city hundreds of thousands of dollars. The city, however, has not the power to prevent a land owner from erecting buildings within the lines of the platted but unopened streets, and must then purchase or condemn such buildings in order to put through any street the site of which they may occupy, unless through amendments of the state constitution the city be relieved from the necessity of paying damages for buildings that may interfere with the carrying out of street plans made and adopted prior to the erection of such buildings. The author quotes the Pennsylvania Act of 1891, which has been repeatedly upheld by the State Supreme Court and the United States District Court, which grants such authority to the cities of that state.

The diagonal thoroughfare planned to be opened in the existing street layout of the city is shown in the accompanying drawing, this diagonal lying in a deep ravine and offering an easy grade of not more than four per cent. The property immediately adjacent to this ravine is well built up, but fortunately no important improvements have been made in the ravine itself. The cost of carrying through this plan, therefore, would be very much less than has been the case in a number of cities where diagonals have been cut through the built-up sections, and the author of the report believes that the expense would be justified by the saving of time to the people using it, as the distance so saved would be more than one-half of a mile.

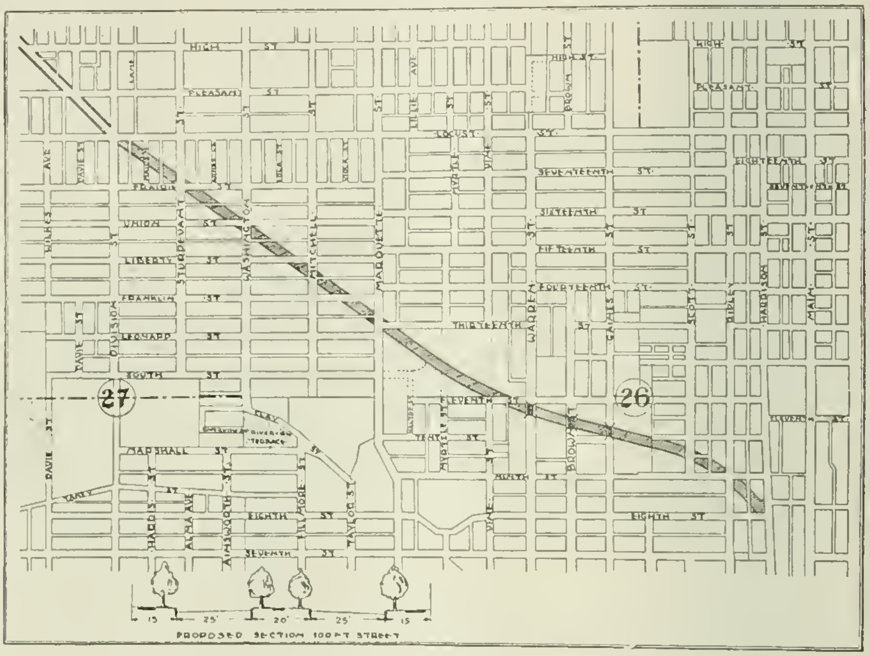
In planning the streets in the annexed territory, the north and south streets leading toward the town are placed closer together than the east and west streets, since more traffic will travel in the former direction. Where possible, the north and south streets are spaced 16 to the mile and the east and west streets 8 to the mile; thus, when 60-foot streets are provided, giving blocks of 270 feet by 600 feet, which, with a 20-foot alley through the center longitudinally, gives a lot depth of 125 feet. As far as possible, streets in the hilly section will run at right angles to the contours rather than parallel, since the latter gives poor building sites, the lots on one side being too high above and those on the other side too much below the street level; but where streets run at right angles to the contours, lots opposite each other will have approximately the same elevation and with a little leveling provide very desirable building sites, each house being a little higher than its neighbor and the properties being separated by terraces.



DAVENPORT BLOCK, SHOWING HOUSES ON ALLEY IN DEEP LOTS.

SIZES OF BUILDING LOTS.

Concerning size of building lots, the report says, "It is highly desirable that a standard minimum size of lots be adopted for residence properties. The evils arising from the platting of lots 20 and 25 feet wide are apparent at a glance. . . . The street will be most attractive where the space between houses is sufficient to give plenty of light and air and provide ample room for simple planting. It is highly desirable, therefore, that if the size of lots is to be decreased, it should be done by shortening the depth of the lot and not the width. The width of lot should be not less than 45 feet, and preferably 50 feet or more, and the depth not less than 100 feet. The recommended minimum standard size for lots is 50 feet by 100 feet. The size of lots in the "Highlands" addition is 50x125. This is a splendid type of development for the workingman's home. Statistics compiled of 16 cities in various parts of the United States show that the sizes of lots vary all the way from 15x50 feet, as the average for Philadelphia, to 200x200 for Syracuse. The general tendencies for most of the cities was an average lot 50x150.

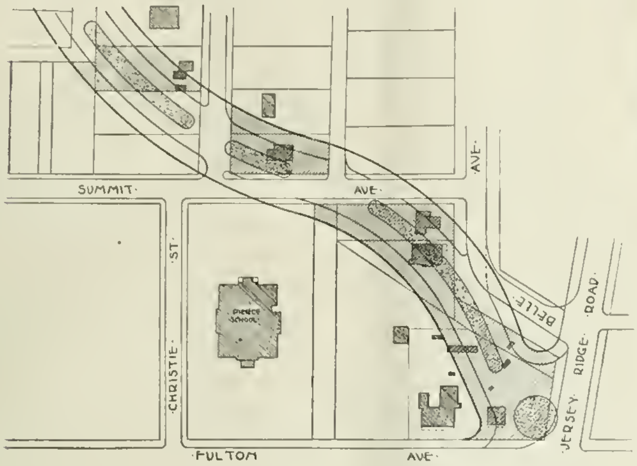


PROPOSED DIAGONAL TRAFFIC WAY.
Extension of Hickory Grove Road to Business center.

"Where the lots are too long, the tendency is to erect houses on the rear of the lot, fronting on the alley. . . . Buildings in the rear tend toward congestion and improper health conditions. The only remedy is to make the lots shorter so that the amount of money invested in land and improvements will be less. There should be lots available for the workingman who cannot afford to buy a large lot to build his cottage on.

"The building of a cheaper class of dwelling on the alleys causes an unsanitary condition of affairs that is not only prejudical to the physical but to the moral health of localities in which it exists. The shortening of lots will no doubt have a tendency to widen them without unduly increasing the cost of the land. More streets for frontage combined with fewer and narrower cross conrecting streets would enable the land owner to do this without burden on the purchaser and we would have districts that would more nearly retain their value."

The building of houses on alleys, when the lots are of the desirable area referred to, would be prevented by limiting the percentage of the lot that residences can cover; reference being made to New York where, in the residential sections, not more than 30 per cent of a lot can be covered by buildings above a point 18 feet above the curb, nor more than 50 per cent below this elevation.



CONTINUATION OF KIRKWOOD BOULEVARD.

SET-BACK OR BUILDING LINES.

The report recommends the obtaining of power by the city to establish building lines on streets in order to permit the future widening of streets at a minimum cost and also to prevent injustice being done to owners of residences who cannot now prevent a single owner from placing a building in front of a generally agreed upon building line and thus injuring the property of an entire block.

With such lines adopted, owners must locate their buildings a prescribed distance back from the street line, although they may use the fronts of their lots for any other legitimate purpose except building upon them. In private residence sections a uniform setback from the street line increases the attractiveness and adds to the health and comfort of the residents, providing abundant light and air, making possible lawns and shade trees in front, and removing the dwellings from the noise, fumes and dust of the street. The setback distance would probably differ in different streets and a study should be made of the ultimate class of buildings in each block or district before establishing such lines.

Local residence streets that have a building line can be given a narrower width for the street itself than could otherwise be permitted, thus reducing development expenses by reducing the amount of land taken and also the outlay for paving. Thus a 60-foot street might be reduced to 40 feet with a 10-foot setback on each side, which the author says might be adequate for streets 800 feet long if developed with single-family houses. If later these houses were replaced with three-story or four-story apartments, the street could be widened to 60 feet to meet the increased traffic requirements caused by the intensive housing.

BUILDING ZONES.

It is also recommended that power be obtained from the state legislature to establish building districts or zones. Berkeley, California, is reported to have passed recently a district ordinance whereby the city might be divided into districts in some of which it might be lawful to construct or maintain certain buildings, or carry on certain trades or callings, which shall be unlawful in other districts. This city has defined 27 different classifications of buildings and industrial districts.

VIEW OF PART OF KIRKWOOD BOULEVARD.

The last General Assembly of Iowa enacted a law giving cities of the third class authority to establish a restricted residence district upon petition of 60 per cent of the property owners residing in said district. Advantage of this act was taken in Davenport recently when an oil company was contemplating erecting an automobile filling station on one of the main residence streets, the property owners petitioning that their street be established as a restricted residence district, which was done, and the oil company prevented from carrying out its plans. According to this law, the restrictions can be set aside at any future time when the growth of the city should demand it, upon petition of 60 per cent of the property owners.

EXCESS CONDEMNATION.

Several pages are devoted to a discussion of the matter of excess condemnation, Mr. Sawistowsky believing that power of excess condemnation is very desirable for Davenport. "New York, Massachusetts, Pennsylvania, Maryland, Ohio and Virginia have statutes permitting the exercises of this power. Hartford has incorporated a clause in her new charter authorizing the practice. In Wisconsin, cities of the first class have the right to purchase excess land, but not to acquire it by condemnation proceedings."

OTHER FEATURES.

Concerning the establishment of a so-called civic center or the grouping of public buildings, practically no plans were made for this, since the present city, county and federal buildings are of ample size for many years to come and the construction of new ones is not contemplated or probable. Several special features are considered and recommended, such as a bathing beach along the river front, another bridge connecting the city

BUILDING PROJECTING BEYOND GENERAL BUILDING LINE INJURES ALL PROPERTY ON THE BLOCK.

with the city of Rock Island, the establishing and gradual development of a parkway along a stream that separates the present city from the territory to the north into which it must extend, the creating of a park on a large island in the river in front of the city (which is already under way), and the establishing of a few small parks in sections of the city where it now is necessary to walk more than a half mile to reach such a park. The report concludes with a proposed law authorizing the establishment of building lines, a proposed constitutional amendment granting power of excess condemnation, another authorizing the creation of a city plan commission, and the text of the act of the Iowa state legislature authorizing restricted residence districts in cities.

WATER WORKS OPERATION

Determining Total Consumption in a System—Learning Whether Amount Indicates Waste or Leakage.

The making of a general investigation as to whether there is any considerable waste in a city as a whole consists of two general processes, one being the determination of the actual consumption, preferably recorded for each hour of both day and night, and the other the calculation, on the basis of this, of the probable amount which may be considered as unnecessary use or leakage.

The simplest and most reliable method of determining the total amount of water entering the system is to place a master meter in each supply main, sufficiently near to the reservoir, pump, or other medium through which the water is supplied, to eliminate any appreciable loss of water between such medium and the meter. Since these mains are ordinarily quite large, the Venturi meter is the type ordinarily employed for this purpose, although quite a number of water works systems are provided with large meters of other types. In some cases it is possible to measure the flow by requiring all of it to pass over a weir on its way from the reservoir to the supply main.

Where the supply is pumped, it is commonly assumed that a certain amount of water is delivered with each stroke of the pump, and the number of strokes being recorded by a pump counter, the amount pumped is calculated on this basis. Unfortunately, all pumps gradually deliver less and less water per stroke as wear, obstructions in valves and other results of operation increase the amount of slip. There is some slip in even the most perfect new pump, while that in an old pump in poor condition may amount to 50 per cent of the pumpage indicated; and yet a number of superintendents report the water consumption of their cities on the basis of pump delivery, in the calculating of which they make no allowance for slip. There can be no question that the only wise plan is to provide a meter or some other appliance for measuring the water that can be relied upon. One great advantage of this in the case of a pumped supply is that the meter record compared with the pump counter calculation will show the amount of slip in the pumps. Slip means energy wasted in the pump, and it should be corrected when it exceeds about six or eight per cent (less for higher efficiency pumps and possibly more may be permitted for those of low efficiency). The discovery of slip followed by its remedy will thus permit an elimination of waste of fuel that will of itself ordinarily justify the installing of the meter.

For a large city, where its cost forms a less appreciable part of the financial statement of the plant and the amounts of waste involved are larger it is desirable to have a self-registering attachment on the meter; but for small plants this probably would not be warranted. Where the meter is not self-registering, a record should be kept of the reading each night and morning, and of the night consumption and day consumption so indicated. Any considerable sudden jump in either will then be known at once and can be investigated.

If neither meter nor weir is available, it is still possible in many cases to determine the consumption quite approximately, especially the night consumption, which is the most important in determining waste. If a pumping system is provided with a distributing reservoir or standpipe, the pumps can be shut down and all consumption drawn from the reservoir or the standpipe, and the amount so withdrawn calculated from the amount of drop of the water surface. In the case of the standpipe, this can be calculated exactly from the horizontal area, which is practically uniform throughout, there being no leakage. (If the exact area is not known, it can be obtained with sufficient exactness by measuring the outside circumference of the standpipe or tank and dividing the square of this circumference by 12.5664.)

The fall in surface may be calculated from pressure gauge readings, especially if it amounts to more than 10 or 15 feet and only a fairly accurate knowledge of the amount of consumption is desired. But for accurate determinations a float and indicator should be used. One that will serve temporarily for summer use can be made very simply by using two small pulleys, a piece of flexible wire (or strong braided waterproof fish line) a little longer than the standpipe is high, a float attached to one end of the wire and a counterweight to the other. A plank about 5 feet long is attached in a horizontal position to the top of the tank close to the ladder, with a pulley at each end, the wire passing through the pulleys and carrying the float on the end that overhangs inside the tank and the counterweight on the end that hangs outside the tank. The horizontal plank is so adjusted in position that the counterweight hangs near one side of the ladder, on which a tape is attached, or near a scale painted or fastened on the side of the tank. The counterweight carries a pointer whose position on the scale indicates that of the float and water surface on the inside.

If the consumption is measured by fall of water level in a reservoir, such measurement can hardly be so accurate as in the case of a standpipe, for two reasons—the sides of the reservoir are more or less irregular in surface, and there is probably more or less seepage or leakage. Before using the reservoir for this purpose, the rate of leakage at different stages of water level should be determined. For this purpose, the outlet valves should all be closed tight (their tightness being ascertained and not assumed), with the reservoir practically full, and the fall in the surface level during 24 hours carefully measured by a hook gauge or level and rod, no inflow of water being permitted meantime. The water is then drawn down not more than one quarter the depth and a similar test made, and this repeated with one-half and one-fourth full depth. If irregularities are noted, indicating that there is a special point of leakage above the lowest level tested, this point should be found and the rate of leakage just above and just below it ascertained.

Careful measurements should be made of the area of water surface in the reservoir at various stages of the water within the range through which it will travel during the waste investigation. This is generally done by running a transit line around the reservoir close to the edge and measuring offsets at close intervals to the edge of the water. During any set of measurements, the level of the water should be read at say 15-minute intervals, and the time of each measurement noted, so that allowance can be made for differences in elevation of the water surface when the different offsets of a given set of readings were taken. A complete set of offsets around the reservoir should be taken at vertical intervals of one to five feet, depending upon the regularity of the slope, the accuracy desired, etc. Generally it is best to combine this measurement and the leakage test, keeping the outlet closed during each set of measurements of water area.

Having made the above determinations, the consumption during any night or day, series of hours or other period can be determined by drawing all the consumption from the standpipe, tank or reservoir, admitting no inflow of water to it meantime, and noting the drop in water level. For a standpipe with its small area, the float and indicator described may be used; but for a reservoir, the fall is so slight that a more accurate method should be employed. Probably the best is a hook gauge, set rigidly in a screen chamber or other structure connected with the reservoir in which the water is not disturbed by wind or other influences. (The hook gauge consists of a hook of brass, bronze or steel, shaped like a fish hook, and fastened at the end of a rod with the hook pointing upward, the rod being made to slide vertically beside a scale graduated generally to tenths and hundredths of a foot, the rod carrying an index mark or pointer, or a vernier by which thousandths of a foot can be read. The rod is moved slowly by means of a screw attached at the top. The hook is lowered until the point is below the water, then raised slowly until the point just raises a "pimple" in the "skin" of the water, when the reading is taken.) Or an appliance operated by clockwork and employing a float resting on still water may be purchased or made, by which a pen is made to register continuously the level of the water.

If there is no meter in the main just outside the pumping station or reservoir to measure the entire consumption, a pitometer can be installed there at relatively small cost, by which a continuous record of the consumption can be obtained. This will generally give more accurate information than that secured by measuring the reservoir and noting water levels, and it is not necessary to interfere at any time with the operation of the system in order to apply it.

If more than one source of supply serves the system, as two reservoirs or a reservoir and a pumping plant, of course either the flow from both must be measured or one of them shut off by a valve that does not leak. If the reservoir receives the surplus of the pump's supply and makes up the deficiency (the direct-indirect system) the reservoir surface may rise at night and during other hours of low consumption, in which case the quantity added to the reservoir must be deducted from the total pumped during the same period in order to obtain the consumption. Also the sum of pumpage and amount drawn from reservoir must be taken to find the day consumption.

Having determined the total amount consumed during a certain period (24 hours, or between 1 or 2 and 5 A. M., are commonly used periods), the problem then is to judge whether this amount is such as to justify a belief that there is waste or leakage sufficient to warrant a detailed investigation. This will be considered next week.

ELECTRIC PUMPING FOR MUNICIPAL WATER WORKS

Comparison with Other Forms of Power on Basis of Cost, Durability and Reliability—Characteristics of Pumps—Choice of Pump.

COMPARISONS OF ELECTRICITY AND OTHER FORMS OF POWER.

The same points should be considered when one is choosing power for pumping as when choosing type of pump—first cost, length of useful life, reliability, and total cost of operation.

Steam, gasoline, and oil engines are all competitors of the electric motor.

First cost means high fixed charges, which should always be included in the total pumping cost. Power plants are arranged in the following order as to first cost: Steam (high), oil, gasoline, electric motor (low).

Steam pumps and pumping engines and electric motors are likely to have a longer useful life than oil and gasoline engines.

Steam power is generally considered the most reliable of all types of power. Electric power is sometimes placed second, not because the motor itself is inferior to the steam plant, but because the motor must depend upon the electric central station and connecting lines. Gasoline engines require less skillful attention than oil engines and for that reason are more reliable.

Comparative total costs of operation with different types of power offer a subject for debate. But the true answer depends largely upon the amount of power required and upon other conditions.

When the costs of fuel only are compared with the cost of electricity, the high-efficiency oil engine takes the lead. Except for small plants, coal costs are lower than gasoline costs. Cost of electric current per 1,000 gallons of water pumped depends partly upon the rate per kilowatt-hour. For large plants it is often higher than coal cost and for moderate sized plants it is likely to be higher than fuel cost for an oil engine.

Fuel costs comprise only part of the total cost of operation by engines. In general the different kinds of power may be arranged as follows in reference to total cost of attendance, lubrication, and repairs: Steam (high), oil, gasoline, electric (low).

Electric pumps are adaptable to remote and automatic control and thus may effect a big saving in operating expense.

A careful study and analysis of the average problem indicates that, with a reasonable rate for current, pumping by electricity results in a lower total of fixed charges and operating expenses than does pumping by any type of engine.

ELECTRIC PUMPING COSTS.

A summary of pumping plant data collected from operating records results in the following averages and ranges:

	Approximate Average.	Approximate Range.
Single-Stage Pumping:		
Daily pumpage, gallons	260,000	40,000-1,000,000
Total head or lift, feet	155	14-305
Kw-hrs. per 1000 gals. (18 plants)	1.08	0.50-1.82
Rate in cents per kw-hr.	3.58	1.5-6.0
Double-Stage Pumping:		
Daily pumpage, gallons	66,000	25,000-135,000
Total head or lift, feet	300	150-525
Kw-hrs. per 1000 gals. (6 plants)	4.39	1.16-9.00
Rate in cents per kw-hr.	3.15	1.7-5.0

From the wide range of kw-hrs. per 1,000 gallons (0.50 to 9.00) and of rates per kw-hr. (1.5c. to 6.0c.), it is evident that the cost of current per 1,000 gallons has a very wide range. The individual reports showed this cost to range from 1.25c to 15.0c, with an approximate average of 5.3c.

The higher costs are in cases of two-stage pumping when the air-lift is used for the first stage. In fact, four out of the six two-stage plants included in the tabulation given above employed the air-lift.

Cost of attendance, lubrication, and maintenance for electric pumping cannot well be summarized for the general case, but it is usually a small fraction of the cost of power.

Fixed charges on the pumping machinery are also usually less than the cost of power. But fixed charges at say 10 per cent on the total water works investment constitute a very large part of the cost of water delivered to consumers.

Only in exceptional cases does the municipality receive sufficient revenue from the sale of water to pay all operating expenses and legitimate fixed charges. A large part of the waterworks investment is due to fire protection and provisions for other public uses of water. Consequently it is appropriate that part of the costs be paid by general taxation.

CHARACTERISTICS OF VARIOUS TYPES OF PUMPS.

For ordinary deep-well pumping, when the outside casing is not over 8 or 10 inches in diameter, the reciprocating pump is most common. It is comparatively economical in power consumption for the smaller sizes, and the low speed at which it is run tends to obviate injurious vibrations and excessive wear. Valves require attention at intervals. To insure successful operation, the inside casing must be plumb and the water must be fairly free from gritty substances. Displacement capacity of the reciprocating pump is determined by bore, stroke, and type of the cylinder and by speed. When water is delivered on the upward stroke only, the speed is necessarily low. Double-acting, double-stroke, and differential-plunger pumps with a cylinder having a 6-inch bore and a 24-inch stroke allow speed up to thirty or more complete strokes per minute.

Centrifugal deep-well pumps with vertical shafts are made for well casings whose inside diameter is not less than ten or twelve inches, and are in general suited to low heads and large discharges as compared to the reciprocating pumps. The centrifugal pump has no valves to repair, but bearings both above and below the ground surface are subject to wear. The runner vanes and other parts struck by the high velocity water may be subject to rapid wear if the water contains injurious solids or compounds in solution.

The propeller deep-well pump with a vertical shaft is made for smaller well casings and for lower heads than is the centrifugal pump. Its chief advantage seems to be a large capacity in a small well casing. One company which makes both types rates the propeller pump at 2,000 gallons per minute from a well of 12 inches inside diameter and the centrifugal pump at 400 gallons per minute from a well of the same size. The shafts of both propeller and centrifugal pumps run at high speeds and require true alignment to prevent excessive vibration and wear.

The air-lift installation has an advantage over other deep-well pumps in that all moving machinery is on the surface and is more accessible for lubrication, adjustment and repairs. A number of wells can be pumped by air from one compressor. In some cases an advantage is gained by the aeration and cooling effect from the expanding air mixed with the rising water. The air-lift is especially adapted to pumping sandy and chemically impure water. It is also less affected than other pumps by certain unfavorable conditions, as for instance a well casing out of plumb.

The air-lift is often employed where the water level is far below the surface, and where extra heavy pump rods would be necessary to insure sufficient strength and stiffness for a reciprocating pump. One catalog has stated that the air-lift "will deliver a greater quantity of fluid from a deep drill-hole than any other method of pumping." A later catalog from another company states that its propeller pump "will furnish a larger amount of water from a well of given diameter than any other known type of pump."

A well, to be equipped with an air-lift, must extend considerably below the water level, during operation, in order to afford sufficient submergence for the air and delivery pipes. According to one authority, the economical submergence is from 55 per cent to 80 per cent of the elevation between the lower end of the piping and the point of discharge above the surface.

Except for low heads, the single-acting plunger pump is most commonly employed for surface work. It is practically always built as a vertical-cylinder, triplex pump, which gives a very nearly steady flow of water. The plungers are easily inspected and it is a comparatively simple matter to renew the packing. This type is better adapted to handling water with gritty matter than is the piston pump, as the water in the cylinder is below the plunger. Plunger pumps are made for moderate and very high heads and for a great range of discharge capacities.

The double-acting piston pump may be considered as the "power" development of the water end of the direct-acting steam pump. The piston pump has less weight and size for a given capacity than the plunger pump and offers the advantage of compactness, especially for horizontal duplex and as a vertical triplex pump, as well as in other forms.

For low heads and large discharge capacities, the surface centrifugal pump is especially favored. It is also built for high heads (multi-stage) and for small capacities. This type of pump offers the advantages of low first cost, economy in space and weight, absence of valves and reciprocating parts, and ability to pass some solid material. The necessary high speed requires accurate balance and frequent attention to bearings. The action of the centrifugal pump depends upon such scientific laws, that a drop from the proper speed with a certain head means a greater drop in capacity than would result with a type of more positive action.

The rotary pump has not yet found much employment for city pumping. Its chief weakness seems to be its inability to stand up under unfavorable conditions. It has been especially subject to wear when the water contains gritty matter. A new style, which may prove more successful, is now being developed for town and city service. Positive force and delivery, without reciprocating motion, and a fairly constant efficiency under changing conditions are the principal advantages of the rotary pump. One manufacturer makes them for capacities up to 175 gallons per minute and for heads up to 115 feet; another makes them for capacities up to 1,050 gallons per minute and for heads up to 460 feet.

Centrifugal pumps possess the advantage over pumps of positive action in that the discharge can be closed, while operation is continued, without wrecking the pump. A centrifugal pump for instance will run with less power under full head and speed when the discharge is zero than when the discharge is normal. It is a measure of safety to provide the discharge pipe of a positive acting pump with a relief or safety valve.

For pumping from pits and open deep wells, centrifugal pumps are made with vertical shafts, and triplex pumps are made with long rods.

Another important characteristic of a pump is its mechanical efficiency, or the ratio of horsepower output to horsepower input. This efficiency is always below 100 per cent, because part of the power delivered to the pump pulley, gear, or shaft, is lost in bearing and water friction and cannot be included in the water power output of the pump.

A pump of positive action, such as a reciprocating or rotary pump, may generally be expected to yield higher efficiency than other types, except possibly for low heads. Additional losses occur in centrifugal and propeller pumps on account of the high-speed "churning" action upon the water. Thermodynamic losses from compressed air cut down the efficiency of the air-lift system.

In general, efficiency increases with increase of head or delivery or with both, but there are likely to be points in changes of head and delivery at which one type of pump will take the lead away from some other type.

Makers' ratings are generally for favorable conditions. After a pump has been in service for some time, more friction or slip may develop and materially lower the efficiency. On the other hand, a pump in service may exceed its rated efficiency.

Reciprocating pumps maintain a fairly constant efficiency under variations in head and speed. A large triplex pump under the best conditions may reach 80 per cent. In many plants the actual value is materially below 80 per cent.

Rotary pumps are similar to reciprocating pumps in maintaining efficiency under varying conditions; its maximum value may approach that of reciprocating pumps.

Centrifugal surface pumps very rarely reach an efficiency as high as 70 per cent, and that only when a very large flow of water is involved. The average efficiency in actual operation is often considerably below the possible maximum because the efficiency falls off rapidly when the head changes from that for which the pump is speeded.

The efficiency of a propeller deep-well pump is generally considered to be lower than that of the centrifugal deep-well pump. According to the catalog of one company which makes both types, the relative efficiencies are about three to two in favor of the centrifugal.

The air-lift is noted for its low efficiency. Efficiency here means ratio of power output in the water to power input to the compressor, and from 10 per cent to 25 per cent is about all that is realized in ordinary practice, although values as high as 35 per cent have been reported. Multi-stage compression, suitable for air cooling, and proper submergence with the right arrangement and sizes of pipes make for economy of power consumption.

On account of its low efficiency, the air-lift is seldom used except under specific conditions which would make other types of pumps unsuitable.

Only high speed pumps are made for direct shaft connection with electric motors. Because of their low speed, reciprocating power pumps are generally driven by a belt, chain, or gears from motors and engines.

Direct connection is, of course, most efficient of the four types of drives mentioned. Belt drive is fairly quiet, possesses flexibility, but requires considerable space. A tightener pulley permits a shorter belt but cuts down the efficiency. Gear drive is fairly efficient, requires a small space, but possesses very little flexibility, and is not recommended where silence is essential. Chain drive is suitable for transmission of much power at a slow speed, in less space than a belt occupies, and in places subject to undue heat and dampness. Well designed and built chain and sprockets are more quiet than all-metal gears but if, from abuse, the chain links become distorted the drive will be noisy and inefficient.

THE CHOICE OF PUMP TYPE AND CAPACITY.

Reliability and net overall economy should determine the choice of pumping equipment. Economy depends upon both fixed charges and operating expenses.

To insure reliability the pump must be of proper type to fit the conditions, must be of ample capacity, must be well designed and stoutly constructed; and, when the extra investment is warranted, a reserve unit may be provided.

For fire protection, an additional pump is sometimes provided, or the service pump may be designed for a higher head than exists under ordinary service.

Operating expenses comprise mostly power, attendance, lubrication, and repair costs. High efficiency results directly in low power consumption. Within certain limits a larger pump will cut down the required attendance in a small town plant by making fewer hours of daily operation necessary. The cost of lubricant is not likely to be an important factor in choice of pump. The cost of repairs is highest when it is attempted to operate a pump under conditions for which it is not suited.

The type of pump is likely to affect the first cost of other equipment. For instance a deep-well centrifugal pump may require, to deliver the same flow, a larger well casing than would a propeller pump. Or a surface centrifugal pump may be directly connected to a high-speed motor while a reciprocating or rotary pump of the same capacity as the centrifugal would have to be belt or gear driven and would require a low-speed and more costly motor.

The question may come up as to whether it would be best to use a deep-well pump for forcing water into the stand pipe or service mains instead of allowing it to pump into a surface reservoir, from which point the water would be delivered into the mains by another pump. If the total head is not too great, better efficiency will usually be obtained by single-stage rather than by two-stage pumping. In a number of Iowa towns, water is successfully raised, by a single deep-well reciprocating pump, from 20, 30 or 40 feet below the surface and delivered into mains against about 100 feet of head.

Centrifugal and propeller deep-well pumps are sometimes provided with booster centrifugal pumps at the surface, mounted on the same shaft as the lower runners.

When the air-lift is used, however, it is generally found more economical to deliver the water into a surface reservoir and to perform the second stage of pumping by a more efficient type of pump.

Propeller pumps are designed for wells in which the water (during operation) is not more than 100 or 150 feet from the surface. The corresponding maximum head for centrifugal deep well pumps is about 200 feet. Reciprocating deep well pumps are made for lifts up to 500 feet, but a cylinder for such a pump is of small delivery capacity. Air-lifts have been installed for even greater heads. One authority recommends that when the air-lift is used for more than 180 feet of elevation, it would be more economical to use two or more air-lifts in series.

In choice of pump capacity, in gallons per minute, some of the primary deciding factors are the daily pumpage required, storage capacity, and the amount of continuous supply available. If the source of water is limited to a certain deep well, the capacity of pump may be limited by the diameter of the well casing.

Not only the average but also the maximum gallons required per day should be known approximately.

In case the supply is to come from a well or wells it is a wise precaution to test the source for maximum flow before choosing a permanent pump. If the supply is to come from a small stream or other source, possibly limited, it is well to know first what the minimum flow during the year will be.

Economy of operation should also have a voice in choosing the size of pump. Large pumping plants may find it economical to have one or more pumps at work practically all the time while other pumps are held in reserve. The small municipal water works with but one pump, in a town of say 1000 population or less, will operate more economically when the pump and storage are of such capacity that the pump need work only a few hours out of the twenty-four. The larger pump and motor or engine are more efficient than the very small unit, the machinery will last longer, less attendance is required, and more time is available for repairs in case of a break-down.

It is wise to choose a pump with a rating well above the actual flow desired. Ratings are usually based on cylinder displacement or upon quite favorable conditions. A new reciprocating pump may deliver from 5 per cent to 10 per cent less water than its cylinder displacement. After the same pump has been used for some time, it is likely to have more slip unless kept in very good repair.

FIRE PROTECTION

The question of fire protection is sometimes the deciding factor which determines whether municipal pumping is to be done by steam or electricity. Reliability is the one important requirement. When steam is adopted it is for one or both of two reasons—unreliable character of the electric current, and a greater faith in the steam pump than in the electric pump.

In case it is conceded that no available source of electric current can be depended upon for faithful service in all emergencies, it is indeed unwise to place trust in the electric pump. But with modern operation in moderate and large-size electric central stations, such a failing can seldom exist. It is a wise precaution to provide two power circuits to the electric fire pump. It seldom occurs that connections can be had with two independent generating plants, but two separate lines can be built from the one plant; more than one generating unit is usually available for fire service: If the generating station is in a distant city and is connected by but one transmission circuit, the most probable chance of possible failure will be in that one line.

Underwriter's direct-acting steam pumps are favored for fire protection because of their simplicity and their flexible yet positive action. They are made with large openings and are very stoutly constructed.

As a competitor of the steam fire pump, the electrically driven direct-connected multiple-stage centrifugal fire pump is offered by manufacturers of power pumps. It is especially designed and constructed to conform to requirements of the fire underwriters. Rated pressure heads usually range from 100 to 150 pounds per square inch. Rated capacities are from 500 to 1500 gallons per minute. These flows would supply from 2 to 6 fire streams, each stream of 250 gallons per minute.

The centrifugal fire pump is comparatively simple, and flexible in operation; yet it can be depended upon to deliver large volumes of water at high pressures. Its characteristics are such that the motor cannot be seriously overloaded, even with the discharge completely closed, or completely opened with no restraining pressure.

The above remarks refer to those systems where the stand pipe, water tower, or pressure tank does not provide sufficient pressure and capacity for fire protection, and where "fire pressure" must come directly from the pump. Most small towns having water towers depend upon stored pumpage and install no special fire pump. In many larger municipalities containing higher buildings and a wider territory, normal service storage and pressure are not sufficient for adequate fire protection.

The cost of operating a steam pump while fighting fire is not considered important. But the expense of keeping the boiler fire banked twenty-four hours per day, and fixed charges on the boiler investment, are very important and are very big items of cost in a town of moderate size where service pumping is done by other than steam power. In case the pumping plant is part of the electric central station, or is adjacent to it, steam-pump fire protection may be maintained at a reasonable cost by means of a steam pipe connection with the central station boilers.

SEWERS AND TYPHOID FEVER.

In the latest annual report of the New York State Board of Health, H. Burdett Cleveland, principal engineer of the Division of Sanitary Engineering, presents a discussion of the relation of sewerage systems to the prevalence of typhoid fever. In this he says: "The influence on typhoid fever death rates of the use of insanitary and inadequate methods of sewerage and excretal wastes disposal, except in respect to sewage contamination of public water supplies, has been little studied and rarely reduced to terms of abnormal death rates from this disease."

A study of the New York State data for twenty years was made to learn what influence adequate and sanitary disposal of the excretal wastes has on the typhoid fever death rate. As far as possible the cities compared were those where other factors in the causation of typhoid fever, such as badly polluted water supply, would not obscure or overshadow the influence of proper sewerage. Only those incorporated places having a population of 1,500 or over, whose water supply was known to be of good sanitary quality, whose milk supply had not been questioned and whose general sanitary conditions in other respects were considered good, were selected for purposes of comparison. The places compared had populations varying from 1,500 to 15,000.

A table was prepared giving the typhoid fever death rates for each of the twenty years from 1895 to 1915 of the municipalities with sewers and similar rates of those without sewers. During the first few years the figures from only 12 municipalities were available, the number gradually increasing until there were 54 during the last two years. Figures for the individual years do not always show the excess on the same side, some years showing a higher death rate for those with sewers than for those without. But the average of all the rates for the twenty years is 17.7 per hundred thousand for municipalities with sewers and 22.3 for those without sewers, or a 26 per cent excess of the unsewered over the sewered municipalities.

It is believed that if due allowance could be made for the effect of other conditions, such as milk and water, a considerably better showing could be made for the sewered cities, since the greatest differences in death rates were found between sewered and unsewered cities where the comparison was affected by such conditions. Since it seems almost impossible to make reliable allowances for such affecting conditions, however, such cities were excluded from those compared.

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SEWERAGE AND RIPARIAN RIGHTS.

A city of fifty thousand population discharges into its sewers in a day about four or five million gallons of foul water or sewage. What can it do with it? In a month it would fill a lake half a mile square and eight feet deep in the center—it cannot store it indefinitely; it is financially impracticable to send it into the air as vapor by means of heat or other methods of evaporation; except in the arid regions, no area of land available to any city could soak up this quantity indefinitely. There is but one solution—this water must ultimately find its way into the ocean, generally through the channel of existing streams. But riparian owners lower down on the stream object to this as interfering with their rights.

The legal question of riparian rights has always been a difficult one and its complications are increasing. The common law theory is that each user must pass on the water unimpaired in either quantity or quality. Practically this is impossible unless all use of the river is abandoned except that of turning water wheels and adding to the beauty of the scenery. No city could withdraw water from it for public use unless it returned it all as pure as it was originally. In a laboratory a glass of sewage can be changed to a glass of safe drinking water, but for a city to so purify its sewage is impossible.

The courts recognize this conflict of necessity with theoretical duties, and the common law has been modified accordingly; while state and federal legislation represents endeavor to strike a fair balance between the common law theory and common sense practice. Elsewhere in this issue is published the essence of a digest of the legal decisions on the subject which, together with a compilation of legislation relating to the subject, has been published by the U. S. Public Health Service.

FIRE FIGHTING A WAR NECESSITY.

Every fire in this country is an aid to the enemy, some fires indirectly only, but others directly by destroying food or ammunition intended for our soldiers or their comrades in arms from other countries. Fighting such fires is as necessary as fighting Huns. And providing equipment for fighting fires here is as essential as providing that required for fighting the enemy over there; in fact, the former is as important a part of the latter as the furnishing of naval convoys to prevent the destruction of war munitions by U-boats.

We believe, therefore, that there can be no question that the officials of cities, especially of those where are manufactured or stored food, ammunition, clothing or any other form of war munitions, should consider it obligatory upon them to maintain their fire departments at high efficiency, and even increase their efficiency. Fire apparatus, hose, and men should be adequate for any demands that may be made upon them; and the fire alarm system, without which these cannot be got to the fire during those first few minutes that are so vital, should be included in the preparedness program.

On the following page chief Ringer gives some suggestions on the saving of grain in mills and elevators from destruction by fire, and emphasizes the importance of automatic sprinklers and other means of combating fires before the department can reach them; and fully as important is the taking of all precautions against the starting of fires—the minimizing of fire risks. In securing these precautions, the firemen as inspectors have a duty as important as in extinguishing fires, and in this they should have the whole-hearted backing of the city officials and the courts in enacting and enforcing the necessary ordinances.

Fire fighting efficiency is as much a war necessity as farming. Cities are under even greater obligation to guard grain from destruction than the farmers are to raise it.

A FEDERAL COUNCIL TO CONTROL ROAD WORK.

All functions of Government agencies relating to streets and highways hereafter are to be coordinated in a body called the United States Highways Council, composed of one representative each from the War Department, the Department of Agriculture, the United States Railroad Administration, the War Industries Board, and the Fuel Administration. The council was formed primarily to prevent delays, financial loss, and uncertainty incident to the method of taking up each highway problem in its turn with a separate and distinct Government agency. This council was constituted at the suggestion of the Secretary of Agriculture. Through the department it will continue the close contact already established, both formally by law and informally by practice, with the State Highway Commission in each state of the Union.

The council consists of Lieut. Col. W. D. Uhler, representing the War Dept.; C. G. Sheffield, Fuel Administration; Richard L. Humphrey, War Industries Bd.; G. W. Kirtley, Railroad Administration; and Logan Waller Page, Office of Public Roads, Dept. of Agriculture. Mr. Page is chairman and J. E. Pennybacker, chief of management of that office, is secretary.

This council operates as a single agency where all highway projects calling for governmental action may be dealt with, whether for deciding questions of finance, materials, transportation, or of war necessity or desirability.

The council has provided a definite form on which applications for relief are to be made through the respective state highway departments, and has sent supplies of the forms to the departments. It emphasizes the great need of conservation of money, transportation, labor, and materials by restricting highway and street work to most essential needs. It ranks maintenance of existing streets and highways first, reconstruction of badly damaged streets and highways next, and it places last new construction justified only on account of vital war or economic necessity.

FIRES IN MILLS AND ELEVATORS.*

Suggestions for Preventing Them—Conclusions from Experiences in Minneapolis—Automatic Sprinklers and All Possible Precautions Necessary.

By C. W. Ringer.†

The following conclusions are derived from practical experience, by diagnosing the causes of actual fires, and I hope that they will be of some value in enabling fire chiefs to safeguard the food of which our soldiers, our allies, the unfortunate neutrals and conquered peoples are now in such pitiful need. The destruction of one of our terminal elevators, filled with grain, means that corresponding thousands of people must go hungry.

The causes of recorded fires come under two heads:

(1) Common, every-day causes of fires, being those of heating, lighting, power-upkeep, and the human element.

(2) Least important fire producers or hazard, such as new and untried types of machinery and devices for increase or refinement of production, which many times fail because of still being in the experimental stage, and sometimes are successful for purpose designed, but produce other conditions that are very objectionable from millers' standpoint.

I know of one special grinding machine which when installed and operated set the mill on fire, and after repeated trials was abandoned; and there are certain types of machines of the screenings-grinding class which should be in a separate and detached building from any mill or elevator. The necessity of mills equipped for grinding wheat to now grind barley or corn, brings into a mill a danger not heretofore serious, as this change needs careful watching until millers are as familiar with handling of these cereals as of wheat; in addition, mills grinding barley or corn can not be kept as free from dust.

The safeguarding of mills, I believe, should be done by systematic inspection of the common fire hazards. Written recommendations should be made in duplicate, one given to the manager or head miller and the other filed for the next inspector to check up. Only by such an inspection can quick results be obtained. The inspections should be made at least once a month or until the mill has lost its bad habits. Most of the fires in our mills are from the common hazards and practically all of our elevator fires can be assigned to this cause.

The question of dust is very important, as it is the originator of a large per cent of our fires. The last three fires in mills were caused by dust in radiators, dust in fan, and dust on live steam pipe lying against a brick wall with insufficient clearance to permit the dust to fall. Therefore, by inspection this dust hazard can be greatly reduced. The disastrous explosion from dust does not now exist in flour mills because of modern dust collector systems, but there are small explosions in grinders and rolls caused by small foreign substances, such as metals and stones, going through the machines. These explosions or flashes travel through spouting and break out at cloth dust collectors, and in most cases will set the mill on fire in many places at the same time. Within the last two months, two of such fires have occurred in our largest mills.

Prevention of fires alone will never be a success, and in proportion to hazards covered, so must the fire extinguishing devices be multiplied and specialized. A flour mill, full of many hazards, all intensified by highly combustible dust, is usually destroyed unless the fire protection is well maintained. A recent fire in one of our largest mills emphasizes this more than a dozen hypothetical cases. A fire originated in a high-speed screenings grinder, owing to a defective bearing, was blown by the fans through metal and wood spouts and elevator legs from the top of the mill to the basement. The metal spouts became so hot as to set fire to the various floors and where touching other woodwork. The automatic sprinkler system worked satisfactorily, but only tended to localize the fire and could not extinguish it, because most of the fire was in spouts out of reach of sprinklers. Fire axes were used to chop open spouts; four private standpipes with 1½-inch hose and one 2½-inch hose were brought into play, thirty-six 2½-gallon chemical extinguishers and several 5-gallon chemical extinguishers were used, many water barrels were emptied and about a dozen Wagoner buckets also were emptied. The organization among the old and experienced millers working on the various floors answered the alarm of fire, the automatic sprinkler supervisory service called the public fire department, and had the fire protection not been efficient in every detail, or failed in any one of the above devices, this mill would certainly have been destroyed. Every piece of fire protection device was in use, and it seemed for a time that the fire could not be stopped, but efficiency and preparedness told. Had this been a dusty mill, there is no question but it would have been totally destroyed. The value of the property was over a million dollars and the fire loss nominal.

After an alarm of fire from a mill or elevator without automatic sprinklers, the building is usually so far gone before the fire department arrives as to be of little service except to confine the fire to the premises; therefore it is now recognized that the most important prevention or protection device is to install an automatic sprinkler system in all mills and elevators of ordinary or fireproof construction, excepting concrete storage tanks without cleaning machinery. In addition to the sprinkler system, which in itself is not sufficient, standpipe and hose, chemicals, fire axes, water barrels and pails, watchman with some means of recording his rounds, fire department call boxes and automatic fire alarm with central station supervisory service, all should be installed.

There is no other class of manufacturing property in which the automatic sprinkler system is out of service or shut off for changes or accidental breakage so many times a year as in flour mills, and this makes regular inspection of all sprinkler controlling valves and water supplies very vital. Some mills have daily inspections by their own men, who make signed reports on the condition of sprinkler systems.

The two important factors, in my opinion, in the fire record of mills in the Northwest are: Inspection and Automatic Sprinkler Systems, and hand fire extinguishing apparatus. Our elevator record is not in comparison, and those which have burned lacked the standard automatic sprinkler system. Flour mills and elevators are of too rapid combustibility and too unwieldy to be left entirely to outside or city department protection.

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*Paper before the International Association of Fire Engineers.

†Chief of Fire Department, Minneapolis, Minn.

The WEEK'S NEWS

Repairing New York City's Streets—No State Highway Census for Massachusetts This Year—Federal Government Urges Disease Notification—Beatrice, Neb., Gas Plant Closed When Higher Rate Refused—Pierre, S. D., Power Plant Burned—Fires in New York and Buffalo—California Utilities Commission Controls Power Production—U. S. Helps Fire Prevention Education—New Motor Apparatus—Grand Rapids' New City Manager—Philadelphia Cancels Contracts.

ROADS AND PAVEMENTS

Get Paving Blocks from Granite Wall.

San Francisco, Cal.—An unusual solution of a troublesome problem has resulted in a profit to the city instead of a loss. In removing the massive granite wall from around the old city hall, hauling the material to the dump would have cost $2,000. It was decided instead to cut the rock into paving blocks about six inches deep, seven to eight inches long and three to four and one-half inches wide. The 75,000 excellent paving blocks obtained were produced at a cost of $37.50 per 1,000, the work being done entirely by hand labor, at $6 per day.

Neglected Streets of New York City.

New York, N. Y.—Street pavements in the borough of Manhattan are not in a condition to respond to the city's war-time needs. Streets in lower Manhattan, which have become the arteries of heavy war-time traffic, are suffering from years of inadequate upkeep and insufficient appropriation. Although the whole attention of the Bureau of Highways is now being given to the repavement of essential thoroughfares, over which the business of the city and the nation mustpass, it is feared that $700,000 will be lacking at the end of the year to complete the schedule of repaving now considered necessary, according to a statement made by Clifford M. Pinckney, chief engineer of the bureau of highways in Manhattan. The street pavements in this borough are worth to-day approximately $35,000,000, he said, or just half what their value would have been if they had not been allowed to deteriorate. Barely to patch up this deterioration from year to year demanded the repaving of thirty miles annually, at a cost of $3,000,000. To overcome the deterioration of past years, and bring the city to an efficient basis, would require the repaving of forty miles annually, with an appropriation of $4,000,000 a year. The present appropriation for Manhattan, Mr. Pinckney said, was $2,000,000, and for the entire city, only $3,500,000. Blame for this condition should not be attached to any one individual or administration, Mr. Pinckney explained. The responsibility rested chiefly with various boards of estimate, he said, for their failure to make sufficient appropriations. Also the lack of fixed policy in regard to repavement and repair of streets had caused the deterioration from which the city suffers, he declared. Each administration, he added, had brought forward new ideas of what should be done with the streets.

"Under war-time conditions," said Mr. Pinckney, "we must apply all our two-million-dollar appropriation to work on the main thoroughfares, so that the essential channels of traffic may be put into condition. Side streets and less important thoroughfares must suffer, naturally, as our $2,000,000 is hardly adequate to meet the pressing need. I expect a $700,000 shortage at the end of the year, due to increased cost of materials, and even without this shortage it will be impossible to repair West street or South street, the two marginal ways. These marginal ways are in disgraceful condition, because the dock department, which exercised jurisdiction over them until a month ago, did not have a dollar for their maintenance. The borough president now has charge of them, but even he may have difficulty in obtaining money. Whether our emergency programme is completed depends partly on whether the Fuel Administration gives us asphalt and the Railroad Administration permits the shipment of material." Mr. Pinckney explained that the conditions of streets in which subway construction was being carried on was the fault of subway contractors. "The moment the contract for a subway is let the street affected passes from our hands to the Public Service Commission," he said, "and we became responsible again only when the work is finished and the subway contractors have repaved the street. They have a custom of laying a temporary pavement for the use of the vehicles while the subway tunnel is settling. This temporary pavement is usually a disgraceful makeshift, from which the public has to suffer."

Skips State Road Census Because of War.

Boston, Mass.—Owing to war conditions the triennial road census of the state will not be taken this year, the highway commission, which has had charge of this work every three years since 1909, having decided that it would be extravagant to use for this purpose the services of a large number of people. The commission's regular force has been so depleted by the enlistment of a great many of its engineers that it is not in such shape that it could properly supervise the census, even if it were thought best to make the count. The road census is regarded as most desirable and even necessary under normal conditions, for it supplies to the commission and to all other road builders exceedingly valuable data as to the character of road that should be built in different sections and on the various routes. The data gathered in the three counts that have been made has contributed vitally to the improvement of the state's system of highways and has unquestionably prevented many expensive mistakes in type of road, that would have happened through using a kind of construction unsuited to the traffic it had to bear. In the census taken in 1915 the count was made at 192 stations scattered all over the Commonwealth. It was carried on for a week in August and for another week in October. The same plan was followed in 1909 and in 1912, though in 1909 there were 238 stations and in 1912, 156.

To make the count this year would require the services of nearly two hundred enumerators and it would take that number of people from other pursuits. To take the road census costs about $10,000. It may be that if conditions change, the census will be taken next year, or it may go over until such time as there is a less urgent call for labor. The commission regrets having to abandon the work this year, mainly because of the tremendous increase in the use of the roads by motor trucks. It is believed that this increase is becoming so great that it will require the rebuilding of many of the state roads, which heretofore have stood up well under the traffic they were called upon to bear, but which will wear out rapidly under the constant traffic of big trucks putting a load of ten tons or more upon the road surface. Without the exact data supplied by a census the increase in this kind of traffic can only be estimated, but informal observations by division engineers will have to take the place of census figures. In 1909, when the first road census was undertaken, and which was one of the first if not actually the first count of its kind made in the United States, there was an average of 247 vehicles of all kinds per station and of this total 96 were motor vehicles and 151 horse-drawn vehicles. By 1912 the use of the roads had increased to 351 vehicles of all kinds per station per day. The motor vehicles had jumped to 222, a gain of 131 per cent and the horse-drawn vehicles had fallen off to 129, a loss of 14 per cent. When the census of 1915 was taken it was found that the average use of the roads had advanced to 606 vehicles per day per station. The motor vehicles had increased to 500, a gain of 129 per cent, and the horse-drawn vehicles had dropped to 106, a loss of 18 per cent. For the six-year period from 1909 to 1915 traffic of all kinds gained 145 per cent. Motor vehicle traffic increased 420 per cent and horse-drawn traffic decreased 30 per cent. At some stations the 1915 count showed as many as 3,000 vehicles passing in a day. It is believed that if a census were taken this year it would show a still more notable gain in all traffic, attributable to the big increase in the number of motor vehicles which have just about doubled in numbers the past three years. When the 1909 census was taken motor trucks were a negligible quantity, and were not counted separately. By 1912, however, motor vehicles for commercial purposes had begun to be used so extensively that the census recorded an average of 11½ a day at each of the 156 stations where the count was made. They formed, however, no more than three per cent of the total traffic. In the three years that followed trucks increased so that in the 1915 census they made up six per cent of the total traffic and averaged 38 per day for all the stations. They increased in these three years 230 per cent against 129 per cent for passenger motor cars. In 1915 there were less than 12,000 commercial motor vehicles in Massachusetts and comparatively little interstate traffic that brought in trucks from other sections. This year there will be nearly three times that number, if the present rate of increase over last year is maintained, and there is a very heavy traffic of long-distance, out-of-state trucks coming into Massachusetts daily. If a census were taken this summer, the commission believes that it would unquestionably show very close to an average of 100 trucks per day per station.

SEWERAGE AND SANITATION

City Wins Fight Over Disposal Plant Site.

Syracuse, N. Y.—According to a decision handed down by the appellate division, Syracuse wins its fight to abandon proceedings started in 1915 to acquire land on the west side of Onondaga lake for a sewage disposal plant. The appellate division has denied a motion for a reargument of the appeal to compel the city to go ahead with its acquisition of land. The court also denied the appellants the privilege of appealing to the Court of Appeals. In June, 1915, a commission was appointed to condemn certain lands and in March, 1916, the committee reported and gave the valuation of the land as $17,161.73. The city thought the price exorbitant and dropped the proceedings. June 15, 1916, the owners of the land procured an order to compel the city to show cause why it should not go ahead with the acquisition of the property. At the same time the city obtained an order for leave to abandon the proceedings. The two orders were argued before justice Leonard C. Crouch in special term and the city won. The property owners appealed to the appellate division, which sustained justice Crouch.

U. S. Urges Disease Notification.

Washington, D. C.—The U. S. Public Health Service has sent the following letter to local health officers: "It is important for the protection of the health of the troops in camps that every community, no matter how small, report the presence of all communicable diseases, especially if present in epidemic proportions. Selected and enlisted men in traveling may be exposed to such diseases and carry them into camp. It is obvious that disease reporting depends primarily upon the doctors, but local health authorities should realize that the grave responsibily rests upon them of obtaining reports of all notifiable diseases from the doctors in their jurisdictions. In addition to rendering more complete reports under present regulations for reporting disease, it is highly desirable that physicians report immediately those cases where a selected or enlisted man has been so exposed to a communicable disease as to be a menace to any camp or post in the United States. For this purpose the following plan of action is suggested by the United States Public Health Service after a conference with Army sanitary authorities:

1. The physician should make an immediate report to the local health authorities, who should notify (by telephone or telegraph if necessary) the senior medical officer of the camp or post to which the selected man or soldier may become a menace. A duplicate notification should be made by the local authorities to the State health authorities.

2. If there be no local health authority having jurisdiction, the physician should notify (by telephone or telegraph if necessary) the State health officer, who should notify (by telephone or telegraph if necessary) the senior medical officer of the camp or post to which the selected man or soldier is about to go.

3. The notification should be explicit, giving name of selected man or soldier and other identification data, together with his address and the nature of the disease.

4. The notification of the senior medical officer of the camp or post by the local or State health authorities should be in addition to the present procedure in such cases.

Health Board May Work Through Organizations.

Indianapolis, Ind.—The city board of health has a right to expend $5,000 through the Children's Aid Association for the upkeep of infant welfare stations, judge Linn D. Hay, of superior court, has decided in denying an injunction sought in a suit brought against the association, the health board and other city officials. The injunction asked would have prevented the health board from paying the $5,000 to the association. It was contended that the appropriation was illegal. "My only duty," said the opinion, "is to enjoin illegal appropriations and payments of money, if any, out of the funds already raised by taxation. The limitation upon the board of health in expending this money is upon the purpose for which it is used and not upon the means or agency by which or through which the object or purpose of the expenditure is attained. The discretion of the board within the spheres of their power, expressed or implied, for the sustaining of life, the protection of the health of the citizens of the city, the prevention of disease and the promotion of infant welfare is not subject to judicial control except in cases of fraud or where the power or discretion is being used, or is about to be grossly abused, to the oppression of the citizens. With this exception the responsibility of the judicious expenditure of moneys raised for this purpose is with the board. The most serious contention presented by the complaint is that the money is appropriated for and paid to the association, a private corporation, for its private purpose and gain. It must be conceded that the evidence does not sustain this contention." The city board of health for several years has had this arrangement with the Children's Aid Association.

WATER SUPPLY

Citizens Not to Vote on Water Works Purchase.

Bayonne, N. J.—The Supreme Court at Trenton has denied an application for a writ of madamus requiring the Bayonne commissioners to call a special election for the purpose of determining whether or not the city should purchase for municipal purposes the water plant of the New York and New Jersey Water Company at an estimated cost of $2,017,000. The commissioners adopted an ordinance with this end in view, but a citizen presented a petition, signed by the requisite number of voters, requesting the holding of a special election, under the provision of the Walsh act.

Supply Fails When Main Is Crushed.

Hood River, Ore.—The break of a main from the Tucker springs water supply furnishing about 1,000,000 gallons daily to Hood River, and the city's chief water supply, brought a temporary water famine here during the hottest days of the year. An official warning was issued, placing a ban on irrigation, and mayor Dumble, in order that sufficient water might be conserved from an old system for fire protection, appealed to the citizens to take as little water as possible for household uses. The main was crushed by the settling of an earth fill that is being thrown across the Indian creek gorge by J. G. Fairfowle, who is doing the work under a contract awarded by the county.

Water Supply Declared Adequate.

Hoboken, N. J.— Deciding that the Hackensack Water Company is equipped to furnish an adequate supply of water to Hoboken, except under the most abnormal conditions, such as prevailed last winter, the board of public utility commissioners at Trenton has handed down a decision dismissing the complaint filed in behalf of the city. The decision points out that in a previous proceeding brought by other municipalities served by the company an order was issued requiring the company to take steps to increase the pressure of its water service. Although Hoboken declined to become a party to these proceedings, the board stated, its service will be improved by the carrying out of the order.

Voters Approve Bonds for Water Supply.

Jacksonville, Ill.—The special election held here for the purpose of voting on the issuance of bonds in the sum of $75,000 to erect a city water system carried by a vote of 2,706 to 547. It was the first bond issue to carry since 1869.

STREET LIGHTING AND POWER

Rate Increase Refused; Gas Plant Shuts Down.

Beatrice, Neb.—More than 1,300 consumers of the local gas company were without light and fuel following the announcement of the company that it would shut down the plant unless granted an increase of 20 per cent in rates. The plant was shut down at midnight. A mass meeting of consumers, the city commissioners and officers of the company met during the evening in an endeavor to adjust differences. It was finally agreed that the plant be run three months and an audit made of the books to determine whether an advance is necessary. The company agreed to the request of the council, with the exception of a provision that in case they were making a profit without the advance they refund the increase. The commission remained firm and the company closed the plant. State fuel administrator Kennedy announced it was possible that some government agency would take over the plant in an endeavor to save coal.

State Commission Takes Over Power Production.

San Francisco, Cal.—Facing immediate power shortage for essential war industries, representatives of the power companies of northern and central California have made an agreement with the state railroad commission by which the commission practically assumes the administration of power production in these parts of the state. "A lowering of the streams by the rain shortage of the past season has lessened sources of waterpower to a serious extent, while the national crisis makes immediate and increasing demands for power," said the commission's announcement calling the conference. It was agreed that the utilities shall pool their power; that the commission shall prepare a priority list of consumers by which industries manufacturing articles not essential to the war shall be the last served; and that a representative committee shall work out a method of compensating some of the smaller power and power purchasing companies whose business is certain to be affected by the priority rules. The priority regulations will not be used until it is absolutely necessary, when, it was emphasized, railroads, ships, utilities and army and navy industries will first be served. Other consumers will be grouped under various classifications, those manufacturing war necessities to have the preference in being given power. While no agreement was reached, it was intimated strongly that electric signs may soon be tabooed—at least until the mountain rainfall increases—and that shopping after dark will be discouraged by the simple process of refusing electric lighting to the stores. The conference, it was brought out, developed as a result of an informal complaint to the commission by the Pacific Gas and Electric Company that it was not getting the power it had contracted for with the Great Western Company. Representatives of the Great Western explained how the light precipitation had interfered with their plans, and investigation brought out the fact that all other power companies in this part of the state, with the possible exception of the Sierra and San Francisco, were in the same predicament, and that unless some remedy was found they would not only be unable to furnish the increased demands for power from the shipyards, powder factories and munitions plants, but could not take care of their established patrons. The commission, in order to handle the new functions, created a department of power administration, of which H. G. Butler, assistant chief engineer of the commission, was given charge. The cost of the power administration will be borne by the companies jointly. The first step toward the power pool agreed upon was taken when the Pacific Gas and Electric, the Northern California Power Company, Consolidated, and the California-Oregon Power Company signed a contract for interconnecting their lines. The work will entail an expenditure of approximately $750,000, and may require sixty days before completion. The new arrangement will make it possible for San Francisco to use power generated over 300 miles away. It is expected that when the priority list is put out in the form of a state order, the companies will be absolved from liability under contracts with some of the smaller industries and power-purchasing companies that will be at the bottom of the list. "Passing judgment on who and who shall not receive power and on the adjustment of equities is one of the gravest duties the commission has ever been called on to exercise," said commissioner E. O. Edgerton. "It may mean death to some of the smaller power-purchasing and manufacturing firms." There was a strong intimation that if some of the smaller power-purchasing companies are financially paralyzed by the priority order, in having their best customers barred from receiving electrical energy, an appeal to the Federal courts will follow on the ground of confiscation. The Fuel Administration, Shipping Board and Food Administration representatives have offered their support to the commission in enforcing the order, however, and how far such an appeal would go is debatable among members of the commission, particularly as the order will be made as a war emergency measure.

Gas Rates Increased.

Muncie, Ind.—The Central Indiana Gas company, of this city, has been authorized, in an order from the public service commission, to increase its rates for natural gas to large consumers from 30 cents a thousand cubic feet to 35 cents for all over 5,000,000 cubic feet consumed in one month, and for artificial gas from 30 cents to 35 cents for all over 2,000,000 cubic feet of gas consumed.

Capitol Plant Supplies Service When City Plant Burns.

Pierre, S. D.—The state of South Dakota came to the rescue of its capital city, Pierre, when the destruction of the city's water and electric light plant by fire was relieved through the use of the electric light plant of the capitol building. The capitol electric plant is a direct current system, and the Pierre plant has been an alternating current, but through the use of a motor generator and the necessary equipment installed in the capitol plant, the city was supplied with light and electric power. The capitol plant can carry the load required and is of sufficient capacity to supply the city needs, and the capitol building, both using a moderate amount of electricity. By winter, when a fuller load would be required, with the legislative session on, and more lights needed by the city also, it is expected Pierre's new plant will be installed. The water situation will be relieved after a few days through the restoration of one of the city pumps, not sufficiently injured in the fire to make it unusable, and it was run by a couple of large steam tractors which were brought in from out in the country north of town. The town had one fire since the destruction of the plant, but it was at once brought under control through the use of the Rapid City chemical engine which had been brought over to Pierre the day after the plant burned here. Lack of water has caused great inconvenience, but no serious results, because a hand pump at the city wells enabled people to get a supply.

FIRE AND POLICE

U. S. to Teach Fire Prevention.

Washington, D. C.—Announcement has been made that the United States Bureau of Education and the National Board of Fire Underwriters have collaborated in a plan to enlist the interest of children in fire prevention. The board has been conducting an energetic campaign among business interests to reduce fire hazards since this country entered the war. Despite the progress made by this propaganda figures compiled by the board show that the losses by fire in 1917 amounted to $250,000,000, or more than in any previous year since 1875 with the exception of 1907, the year of the San Francisco earthquake and conflagration. The federal Bureau of Education is sending to state and county superintendents and to local boards of education throughout the country copies of a ninety-one-page manual upon the subject, with the suggestion that it be made a regular textbook for use in the first half of the seventh grade work. This idea has been endorsed by many national and state officials. The booklet is entitled "Safeguarding the Home Against Fire," with a sub-title, "A Fire Prevention Manual for the School Children of America." The manual was prepared by the national board, and contains very practical "don'ts" and "do's" in connection with all possible fire agencies. It is interestingly illustrated.

Whole Force Fights Difficult Furniture Blaze.

New York, N. Y.—The seven-story brick warehouse and factory of a furniture and carpet company was totally wrecked by fire and the damage to stock and building was estimated at $150,000. It was one of the smokiest fires that the New York fire department has fought in years. The blaze sent up volumes of dense suffocating smoke that formed a pall extending across many blocks for several hours. Five alarms, mobilizing the entire Manhattan force, were sounded, the first at 4.30 p. m., and it was not until nearly 8 o'clock that the fire was under control. Twenty firemen were affected by the smoke, but remained at their task after being treated by ambulance surgeons. The fire started on the fourth floor among paints and varnishes, where fifteen employees were working, and quickly spread. A stiff breeze from the west fanned the blaze and the brewing company adjoining on the west and south was threatened for several hours. Hundreds of tenants in tenements east of the burning structure were driven out of their homes by the smoke. Many packed suitcases and took bedding, fearing a spreading conflagration. Three hours after the fire had been raging a V-shaped portion of the front wall from the fourth to the seventh floors collapsed, falling into the street, showering and disabling water tower No. 3, from which thirty firemen were compelled to jump to escape injury. One man sustained slight abrasions of the arms and face and was sent home. A cheer went up from the bystanders as fireman Joe Christie stood his post on the street with debris showering him and continued playing his hose on the fire. The firemen fought the blaze in relays, being unable to stay for any period in the dense smoke enshrouding the structure. Fire fighter after fire fighter collapsed to the pavement and was carried to safety by his comrades on the side streets and attended by a staff of physicians from neighboring hospitals.

Low Pressure; Fire Sweeps County Hospital.

Buffalo, N. Y.—Augmented by a brisk wind from the north and low water pressure, fire, which started from the explosion of a steam cylinder head under the pharmacy department, destroyed eight buildings at the Erie county home and hospital before it was brought under control, causing a loss of $200,000 or more. There were no casualties, although there were 350 patients in the part of the hospital destroyed. Through the fine work of attendants and firemen, the patients were carried to safety before the flames reached them. The apparatus at the hospital was unable to cope with it, and Buffalo firemen were summoned. Fire chief McConnell of this city was soon on the scene, and a second alarm was sent in, bringing a total of about fifteen companies to the fire. The hospital, which is located near the north city line is at a high elevation, and this made the water pressure low, hampering the work of the firemen. After a battle which lasted an hour and a half, however, they managed to bring the flames under control. The buildings, one and two stories, frame and stone, which were destroyed were: Tuberculosis building, the sleeping quarters of the tuberculosis patients, the laundry, the kitchen, the bakery, maternity building, engine room and three wooden passageways connecting them. The main building, at the rear of which the fire started, was partly fireswept. The wooden passageways connecting the buildings served as a path for the flames. The 350 patients in that part of the hospital destroyed, many of them unable to walk, and some new-born babies, were carried out on their beds, and deposited on the lawn, or carried to the groves at the rear of the hospital. Every ambulance in the city was called to the scene of the fire, and when it was announced that the fire was under control, they were busy removing the shelterless patients to the various Buffalo hospitals. All during the fire, aeroplanes from Curtiss field hummed overhead, the aviators attracted by the flames and smoke. In addition to the ambulances, dozens of automobiles and motor trucks were pressed into services and were used in removing patients to hospitals. Workers were choked by smoke which filled the damaged buildings long before they took fire. But for the fact that the wind was from the north rather than from the opposite direction the greater portion of the institution would probably have been destroyed. Weak streams trickled from the firemen's nozzles as they sought in vain to stay the progress of the flames. Large buildings were consumed with the firemen helpless because of the low water.

MOTOR VEHICLES

New Triple Does Well in Tests.

Charleston, W. V.—Highly pleased with the performance of the new American-La France Type 75 triple combination, the committee in charge of the tests representing the Business Men's Association and business men, the city council, the fire department, civil service board, composed of James I. Pratt, T. B. Davis, city manager M. J. McChesney and fire chief J. Cal Anderson, have notified mayor George A. MacQueen of the acceptance of the machine following thorough tests. The engine test was run four hours without stopping. No pump or engine trouble was experienced during this test. Water was drafted eleven feet, five inches from the Kanawha River on the city levee. A hill-climbing test on the South Side hill was made and a road test of about forty miles was run. The chemical tank was also tested, and all of the tests complied with the contract and specifications. In almost every instance the machine exceeded the power and efficiency that had been guaranteed for it. In the first test the net pump pressure was 119.6; net nozzle pressure corrected, 79.2; average discharge gallons per minute, 809.4; duration of test, two hours. This test was made for full displacement. In the second test the net pump pressure was 200.4; net nozzle pressure corrected, 60.1; average discharge gallons per minute, 434; duration of test, one hour.

Federal Motor Service Combined.

Washington, D. C.—A motors transport service has been created by the War Department to take the place of the motors division of the quartermaster corps. The service will be headed by a general officer, who will serve as an assistant to the quartermaster-general. The new service will consolidate the procurement and operation of all army motor vehicles except the tanks, caterpillars and artillery tractors. A special board of officers is working out details for operation by the service of all classes of trucks, ambulances and motor cars. The object is to eliminate duplication in the purchase, operation and maintenance of motor vehicles. Each arm of the service having use for motor transportation will be represented in the new service. The motors division has been headed by Brigadier-General Chauncey M. Baker, who, it is understood, will revert to his regular army rank as a colonel of the quartermaster corps. Christian Girl of Cleveland is expected to remain under the reorganized service as chief civilian adviser on motor truck production. For the first time since the production of motor trucks was begun the output in April exceeded 1,000 cars of the three-ton type. From now on the output is expected to show a cumulative increase, the May production being 1,500.

Cost of Running Police Autos.

San Diego, Cal.—According to Carl H. Martin, machinist for the police department, it costs slightly more than seven cents a mile to maintain an automobile, based on figures on the maintenance expenses for the four machines used in the police work. The machines are one seven-passenger Cadillac, one ambulance patrol and two Dodge cars. For the year of 1917 the four cars traveled a total of 40,030 miles. The cost of gasoline per mile figures to $.0196; oil cost $.0018 per mile, and tires cost $.0354 per mile; while miscellaneous charges amounted to $.0164 per mile, making a total cost per mile of $.0732.

Six New Fire Pumpers Installed.

Portland, Ore.—Added protection to the Portland shipbuilding industry, and homes as well, was given when six new fire engine pumping machines were recently put into service at various fire stations by city commissioner Bigelow. This meant the retirement of about thirty-seven horses and the closing of a number of outlying fire stations because the automobile pumpers will cover a greater area of territory than the horse-drawn vehicles. The installation of the machines was held up for more than a month by a civil action brought against the city in an effort to restrain the commissioners from accepting the machines. restrain the city commissioners from accepting the machines.

GOVERNMENT AND FINANCE

Plans for Financial Aid to Utilities.

Washington, D. C.—Announcement has been made of the appointment of a committe of bankers who are to co-operate with the War Finance Corporation in the consideration of the financial requirements of public utility companies. This committee is composed of James N. Wallace, President of the Central Union Trust Company; Charles H. Sabin, President of the Guaranty Trust Company; Thomas W. Lamont of J. P. Morgan & Co., and Frederick Strauss of J. & W. Seligman & Co. This follows a recent conference of bankers, War Finance Corporation directors and utility men. This committee is said to have under consideration the organization of a $100,000,000 corporation, the function of which would be to purchase the securities of public utilities and in turn discount its paper with the War Finance Corporation. Bankers throughout the country would be asked to subscribe to the capital stock of the company in proportion to their ability to do so, thus spreading any risk which might be involved and at the same time insuring the active co-operation of leading financial interests in all sections toward securing better treatment for public service properties. This plan is not popular among bankers. The Chicago Clearing House has named E. D. Hulbert, of the Merchants Loan & Trust Company; George M. Reynolds, of the Continental & Commercial Bank, and F. O. Wetmore, of the First National Bank, as a committee to consider the need of public utility relief from the various financial burdens of the present.

The War Industries Board has sent to Congress the draft of a proposed bill to appropriate $200,000,000 to increase the power supply in overloaded industrial centers of the East. Cities along the Atlantic seaboard in which munitions and materials for war are being manufactured would be the especial beneficiaries under the measure, which has been committed to the care for the present of Representative Kitchin, chairman of the House ways and means committee, and of Senator Martin of Virginia, chairman of the appropriations committee. The measure is said to have the backing of President Wilson. It is felt in Washington that much more than $200,000,000 will be needed, inasmuch as in the Pittsburgh district alone, which supplies power for a radius of 100 miles, $40,000,000 or $50,000,000 for additional plant facilities might be needed. The War Industries Board is now making a census of the various power needs of the different localities engaged upon war work.

New Manager for Grand Rapids.

Grand Rapids, Mich.—Manager Gaylord C. Cummin, who recently resigned "as a result of interference upon the part of his commission in certain of the administrative departments," has been succeeded by Fred H. Locke, formerly the director of the public welfare department. The relations between manager Cummin and the commission had been growing continually more strained for some time. Manager Cummin finally announced that he would resign if the commission changed the method of operation of his departments, on the grounds that he did not care to assume responsibility for the results produced by an organization which was altered without his consent. The commission, disregarding the challenge, made certain changes at the time of passing the budget and the manager's resignation resulted. Mr. Cummin has been recognized as one of the leading men in the city manager profession, and at the Detroit convention last November he was elected president of the City Managers' Association. He has had a rapid rise. His first experience under the commission-manager regime was as city engineer under Manager Henry M. Waite at Dayton, Ohio. He was appointed manager of Jackson, Mich., in 1915, at a salary of $5,000, this was increased the next year to $6,000, then to $7,500 and the Grand Rapids position has paid $10,000. Mr. Cummin is now assistant to the president of the Kelsey-Brewer Co., public utility operators at Grand Rapids.

City Votes to Retain Commission Form.

Huron, S. D.—At the recent election every ward in the city registered a majority for the commission form of government.

To Cancel "Non-Essential" Contracts.

Philadelphia, Pa.—Councils have passed a measure making it possible for the mayor, with the assistance of the city solicitor, city controller and a department head, to arrive at a basis for the cancellation of all contracts that do not directly aid wartime activities. The final decision as to the terms of cancellation in each particular case will rest with councils and for that reason special sessions may have to be called or financial settlements postponed until fall. Councils, under the contract bill, as finally framed, may be called together at any time to confirm or reject settlements agreed to by contractors and city officials. Most of the contracts to be annulled lie in the department of public works and director Datesman hopes to have much of the work completed before a settlement is arrived at. Because of the many unusual items entering into the annullment of the subway contracts held by the Keystone State Construction Company, an ordinance giving the mayor and director Twining the right to settle with the company was passed. Unlike the general ordinance on the settlement of contracts, this bill permits the officials to settle without referring their settlement to councils for ratification. On but two of the subway contracts—the ones for Arch and Locust streets—is the National Surety Company, the concern for which the Thomas B. Smith company is Philadelphia agent, the surety. The contracts total $2,900,000, and the annullment of them leaves the mayor's company without further responsibility and with the full premium paid. As yet the mayor has made no announcement of his plan to settle equitably the bonding end of the contracts with the city.

NEWS OF THE SOCIETIES

CALENDAR OF MEETINGS.

June 27-29.—AMERICAN CONCRETE INSTITUTE. Annual meeting, Atlantic City, N. J.

June 26-29.—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual meeting, Northwestern University, Evanston, Ill.

July 10-12.—OHIO ELECTRIC LIGHT ASSOCIATION. Twenty-fourth annual convention, Breakers Hotel, Cedar Point, O. Secretary, D. L. Gaskill, Greenville, O.

Aug. 27-29.—LEAGUE OF CITIES OF THIRD CLASS IN PENNSYLVANIA. Nineteenth annual meeting, Erie, Pa. Secretary, Fred H. Gates, city clerk, Wilkes-Barre, Pa.

Sept. 24-27.—INTERNATIONAL ASSOSOCIATION OF MUNICIPAL ELECTRICIANS. Annual convention, Atlanta, Ga. Secretary, Clarence R. George, Houston, Tex.

Oct. 2-4.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Annual meeting, Buffalo, N. Y. Secretary, Charles Carroll Brown, 304 E. Walnut St., Bloomington, Ill.

International Association of Fire Engineers.

The International Association of Fire Engineers held its forty-sixth annual convention beginning June 4, in Chicago, the headquarters being at the Hotel Sherman.

Chief Thomas A. Clancy opened the meeting; city prosecutor Harry B. Miller, representing mayor Thompson of Chicago, delivered the address of welcome and fire marshal Thomas O'Connor of Chicago added his greetings. Chief William H. Bywater of Salt Lake City responded. The names of the committees for the convention were then read.

At the afternoon session, president Clancy read a communication from chief W. L. Sandidge of Lynchburg, Va., urging that the association request the government to exempt from military service all men in fire department service because of the great difficulties facing fire work because of war conditions. Chief John Kenlon of New York, read a paper on "Automatic Sprinkler Alarm Service." At his suggestion, a committee was appointed to investigate and report on a method of standardizing equipment of sprinkler systems and alarms. Chiefs Philip J. Harty of the Youngstown, O., Sheet and Tube Co.; N. V. Holmes, fire marshal of Sears, Roebuck & Co., of Chicago, and chief Thomas J. O'Connor of the General Electric Co., Schenectady, N. Y., discussed "The Relation of City with Industrial Plant Departments and the Best Methods of Co-operation." The subject was referred to a special committee to cooperate with industrial plant chiefs. Chief Kenlon of New York suggested that rules be formulated for the benefit of such chiefs who are seeking information. Chief Espey of Elmira urged that more protection be given to fire-fighting equipment in industrial plants.

A memorial service was held in the evening in honor of the members who have died since the previous convention. Addresses were made by Rt. Rev. Bishop Samuel Fallows, Michael L. Igoe of the Illinois legislature, and chief C. H. Henderson of Bradford, Pa. The report was read of the committee on memorial resolutions, of which chief F. J. Wagner of Washington, D. C., is chairman.

The Wednesdaw morning session was presided over by vice-president A. A. Rozetta of Nashville, Tenn. F. M. Griswold, of the National Fire Protection Association, spoke on the work of standardizing couplings and standardizing the tools with which the conversion is done. Chief William H. Murphy of Philadelphia read a paper dealing with "Exposure Hazards." "Four Wheel Motor Apparatus" was the subject of a paper by chief William H. Daggett of Springfield, Mass., read into the proceedings. Much discussion followed the paper on "Drill and Training, What Kind? How Frequently? And What Provision Necessary For?" by chief Frank G. Reynolds of Augusta, Ga.

After a luncheon at the Hotel Sherman, at which E. A. Bancroft, general counsel of the International Harvester Co., made a greatly appreciated patriotic address, the delegates visited the Underwriters Laboratories and then an exhibition of fire apparatus in action at the Municipal Pier. An alarm was sent in and nearby apparatus responded, including motor pumping engines and ladders. A fireboat was demonstrated and also two pumps installed on the pier.

At the round table discussion in the evening, fire marshal James McFall of the Emergency Fleet Corporation of the U. S. Shipping Board opened on the subject "Fire Equippment and Protection of Our National Shipyards." The whole subject of protection of yards, as well as munition and other war factories, was threshed out and the methods of co-operation between city departments and plants discussed in detail. A resolution that a committee be appointed to report on the possibilities of training women for fire department work such as office duties or with the fire alarm service was defeated. With chief Kenlon in the chair, the subjects of exercise and recreation were discussed. The porblem of two-platoons was brought up in the consideration of the topics, "How Can Inspections of Buildings Best Be Carried On in Two-Platoon Departments?" and "Can Men in Off-Shift in Two-Platoon Departments Be Depended on for Serious Fires? If So, What Arrangements Are Necessary for Calling Them?"

The Thursday morning session opened with a paper on "Feasibility of Gasoline Driven Fire Boats," by chief Charles Schnibben. The same topic was taken up in a paper by A. B.

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PROBLEMS CITIES ARE STUDYING
WITH EXPERTS

Lawrence County, Deadwood, S. D., is to improve about 16 miles of ROAD. The engineer for the work is J. A. Whittaker.

North Bergen, N. J., is to make STREET IMPROVEMENTS. The engineer, S. Maulbeck, has been retained to draw plans for the work.

A SEWERAGE SYSTEM is to be built by the village of Dearborn, Mich. The consulting engineer for the improvement is Clarence W. Hubbell.

The Essex Border Utilities Commission, Windsor, Ont., is to instal new SEWAGE PUMPING equipment. Morris Knowles, Ltd., is in charge of the whole project.

Berrien County, St. Joseph, Mich., is to build a concrete BRIDGE to cost about $75,000. Plans and specifications for the structure were prepared by Charles W. Cole.

Riverside County, Riverside, Cal., is considering a big IRRIGATION SYSTEM for part of the Chucawalla desert at a cost of $4,000,000. The engineering firm of Koebig & Koebig has been retained to make a survey of the area.

New SEWERS and SIDEWALKS are to be built by Rochester, Mich. Plans were prepared by the Southern Michigan Engineering Co.

Coke County, Robert Lee, Tex., is to construct fifty miles of HIGHWAY. The engineers for the improvement are the firm of Hess & Skinner.

The paving of STREETS and the construction of BRIDGES are improvements projected by Mill Valley, Cal. The engineer for the work is C. E. Sloan.

An OUTFALL SEWER is to be built by Merchantville, N. J. The engineering firm of Remington & Vosbury had charge of the plans for the work.

The WATERWORKS of Peekskill, N. Y., will be improved by the installation of new pumping equipment. The consulting engineer for the work is Henry W. Taylor.

Boston, Mass., is to undertake the RESTORATION of the historic Faneuil Hall, including fireproofing and fire protection. The firm of Cram & Ferguson, architects, has been retained to have charge of the work.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

KOEHRING MIXER LOADER.

New Device Eliminates Wheelbarrows and Cuts Costs.

The Koehring mixer loader is a combination of measuring bins and the belt conveyor principle applied to a light portable machine, which is supplied with its own power, and traction, moving from job to job under its own power and in paving work preceding the mixer. Its main purpose is to save labor and money and in these days of innumerable difficulties for the contractor, such a machine will prove of inestimable value. The loader is designed to eliminate all wheelbarrows and therefore to increase the production of the mixer; reduce the danger of interruption due to labor shortage, and help finishing up contracts on time.

The loader is adapted for use either with end-loading paving mixers or with side-loaders used in construction work. It can be used with any mixer without changes in the mixer except the placing of a baffle plate in open end loading skips, which is a simple job for any local mechanic. No baffle plate is required with closed end loading skip.

In paving work it precedes the mixer under its own power. In use with side-loading construction mixers it bridges the gap between materials and the mixer—thus the materials may be unloaded at the curb side, shoveled into the measuring bins of the loader and conveyed by the moving belt to the mixer at the base of an elevating tower, at the side, or on the inside of the building.

How much the saving due to elimination of all wheelbarrows amounts to depends, of course, on the individual practice in loading crew organization, as well as on the individual shovelers. No estimate of the money-saving possibility can be absolutely accurate. However, the use of the Koehring loader in operation of a two-bag paving machine on street work shows the possible pay-roll saving. The loading crew usually consists of four wheelers for stone and two for sand—in other words six wheelers per batch—and two sets of wheelers and one set additional shovelers are usually required to keep the mixer operating at top capacity. This means in all eighteen men. If, with the Koehring mixer loader six men are retained for shoveling materials from sub-grade into measuring bins of the loader, a total of twelve men or all the wheelers have been eliminated. In addition to this pay-roll saving, there is a material cut in yardage costs due to the consistent, high-speed operation of the mixer made possible by continuous loading of the mixer without any delay.

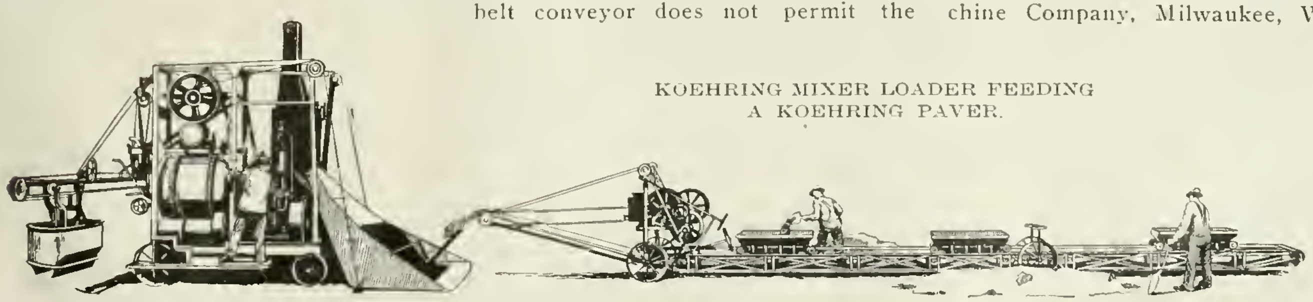
The full over-all length of the machine is approximately sixty feet. It receives materials from any point within this distance of the mixer. For shipping, half of the frame is quickly detachable. The measuring bins are mounted on the frame and provided with wheels which roll on tracks on the top and along the length of the frame. According to the capacity of the mixer, two or three bins are provided. As materials are shoveled from the subgrade, as in paving work, these bins are moved along the top of the frame to maintain them in convenient shoveling position to materials. Each bin is adjustable. The sides are extendable so as to hold the proper proportion of aggregate for any size of batch. By striking off the bins an accurate measurement of materials is obtained. The entire frame is adjustable up and down, providing plenty of clearance for traveling from job to job, and permitting the structure to be lowered to a point of small "lifts" in shoveling materials from the subgrade. The range of this adjustability is ten inches.

When bins are filled with aggregate, properly measured, a lever control opens the bottom of each bin, permitting aggregate to fall on the conveyor belt, moving at the speed of 500 feet per minute, which carries materials to the mixer and into the loading skip, which is then operated in the usual way. The speed of the conveyor belt, necessitates the use, either of the loading skip or a measuring batch hopper, because the high speed of the belt conveyor does not permit the new charge to be started toward the drum until the last batch has been completely discharged. This would cause a delay on each batch, and a delay on the part of the bin loaders. The mixer loading skip or batch hopper, however, is always ready to receive the aggregate from the belt conveyor, and the shovelers can instantly reload the measuring bins of the loader. In the meanwhile when the last batch has been two-thirds discharged from the drum, the loading skip has been started as is the usual practice so that the new aggregate enters the drum at the instant the last preceding batch is discharged.

The regular loading skip or measuring batch hopper thus serves the function of a storage supply of aggregate instantly available, permitting the measuring bins of the mixer loader to be refilled without reference to the discharge of the preceding batch from the drum. The conveyor belt is easily adjusted, both in regard to slack and to maintain its flat horizontal position so that materials will not spill even when the frame is resting on the incline of a sub-grade.

The frame is made of trussed angle iron and the trucks are all steel, with automatic type knuckle steering axle. The frame can be lowered or raised 10 inches. The machine can turn in a radius of 63 feet, or 55 when the end is detached. The belt is of four-ply rubber, 22 inches wide, running 500 feet per minute. The measuring bins have a top opening 36 in. wide and 48 in. long, the height from the ground being 29½ to 34½ in. The bins can be adjusted at half cubic foot intervals from 3½ to 6½, inclusive, and also for a capacity of 7¼ cubic feet. The capacity of the machine is 100 cubic feet per minute. Power is from a 5 h. p. horizontal four-cycle hopper cooled gasoline engine. Traction speed is 70 feet per minute forward and 75 reverse. All bearings are of the universal type, supplied with compression grease cups.

The loader which is shown in the accompanying illustration, is made by the makers of the well-known line of concrete equipment, the Koehring Machine Company, Milwaukee, Wis.



KOEHRING MIXER LOADER FEEDING A KOEHRING PAVER.

INDUSTRIAL NEWS

Cast Iron Pipe.—Manufacturers of cast iron pipe are engaged for more than 50 per cent of capacity on Government work, so that private buying is not very definite as to delivery and dependent on the supply of pig iron available after direct and indirect war needs are satisfied. At the present time pipe for non-war enterprises can be delivered in six to eight weeks. The orders for Government use come from a variety of sources and altogether involve a considerable tonnage. Government prices include new freight rates. Quotations: Chicago: 4-inch, $65.05; 6-inch and larger, $62.05; Class A $1 extra. Birmingham: 4-inch, $58; 6-inch and larger, $55; Class A $1 extra. New York; 4-inch, $64.75; 6-inch and larger, $64.75; Class A $1 extra.

Cement Placed on Priorities List.

The recent action of the War Industries Board in placing cement on the priorities list until August 1 is expected to have vital effect on building material and construction interests. This is the first really official indication that the federal authorities have recognized basic building materials as equally important as steel, iron and similar products. The Portland cement industry has been on the essential list since April 30, but owing to shortage of labor, production in Zone 1, at least, has not exceeded 55 per cent of normal. Meanwhile, consumption of this commodity, mainly for war purposes, has been so great that the supply is endangered. The War Industries Board, before which the conference was held, was reluctuant to take the period longer than August 1 because it was not certain just what the fuel situation will be then, but later on there is to be another conference to determine whether the priorities shall be continued further than August 1.

The American Appraisal Company, Milwaukee, Wis., with offices in the principal cities, has recently made two appraisals of interest. In connection with a difficult controversy between the city of Norfolk, Va., and the Norfolk County Water Co., in which the United States Government is now interested, the American Appraisal Company made an appraisal of the plant. It also recently appraised the plant of the Montreal Water and Power Co., and is now revising this work for possible court proceedings. The American Appraisal Company's booklet, "Modern Appraisal Service", gives an interesting account of the growth of the organization and the wide acceptance of its principles of impartial valuation. The "continuous service" developed by the company is described—a system by which the appraisal is made the beginning of co-operation between the company and the plant management in maintenance of scientific control over all accounting and financing in harmony with the appraisal. The use of appraisal for accounting and cost-finding, taxation, fire insurance, banking, credit, etc., is explained. The company makes appraisals of public utility and municipal property, industrial plants, residences, lands, commercial and other property.

NEWS OF THE SOCIETIES

(*Continued on page 538*)

Stevens, a marine engineer of Jacksonville, Fla., and the general opinion seemed to favor the prospects for success for gasoline boats. The fighting of fire on board vessels was considered in a paper by deputy chief Worth of New York. Fire prevention in munition plants and conservation were taken up by former fire commissioner Herman L. Ekern of Wisconsin.

In the afternoon district chief Shallow of Boston read a paper on fire-fighting in vessels and chief C. W. Ringer read one on "The Proper Safeguarding and Prevention of Fires in Mills and Elevators" (see this issue).

The determination of the next meeting place and date was left to the board of directors. A resolution by chief Kenlon that the federal authorities be requested to grant priority for fire department equipment was approved. The secretary reported that 260 active members, two honorary and 86 associate members were in attendance at the convention. The report of a special committee on sprinkler systems, of which chief Howard L. Stanton is chairman, was ordered printed. The delegates approved an amendment to the constitution, proposed at the previous convention, by which associate members may be elected to life membership without payment of a fee.

The following officers were elected: Chief A. A. Rozetta, of Nashville, Tenn., president; chief John Kenlon, of New York City, first vice-president; chief John F. Healy, of Denver, Col., second vice-president; marshal James McFall, of Washington, D. C., secretary, and chief Peter J. Carter, of Camden, N. J., treasurer. The following were named as state vice-presidents by the committee on the subject:

Alabama, J. W. Blakely; Arizona, B. W. Norton; Arkansas, Lloyd Tate; California, M. D. Murphy; Colorado, P. D. McCartin; Connecticut, Henry H. Heitman; Dist. of Columbia, F. J. Wagner; Delaware, Patrick J. Golden; Florida, Chief Coleman; Georgia, A. J. Land; Illinois, C. W. Devore; Indiana, Edward Shannan; Iowa, Peter Denger; Kansas, John McNawey; Kentucky, Edward Griffith; Louisiana, Frank Roddy; Maine, George Stackpole; Maryland, August Emrich; Massachusetts, W. H. Daggett; Michigan, C. H. Russell; Minnesota, Frank Whitmore; Mississippi, E. P. Donovan, Missouri, P. P. Kane; Manitoba, J. E. Buchanan; Nebraska, Robert Lewis; New Hampshire, Arthur Spring; North Carolina, Charles Schnibben; North Dakota, J. H. Kelly; New Mexico, Jacob Klein; New York, Howard Rodgers; New Jersey, Harry Francis; Ohio, C. R. Bowersox; Oregon, Charles Foster; Oklahoma, Charles Chapman; Ontario, J. Smith; Pennsylvania, Fred Vanderholdt; Rhode Island, Reubon Weeks; South Carolina, H. B. Wells; South Dakota, Wm. A. Sloan; Saskatchewan, W. A. White; Tennessee, B. L. Warlick; Texas, B. S. Fritz; Utah, G. A. Graves; Vermont, F. J. Guerin; Virginia, W. H. Joynes; Washington, F. L. Stetson; W. Virginia, E. T. Rose; Wisconsin, W. R. Trotter; Wyoming, T. J. Cahill.

National Board of Fire Underwriters.

Losses by fire in the United States in 1917 aggregate $250,753,640 against $214,530,995 in 1916, the losses last year having exceeded any year since 1875, with the exception of the San Francisco fire in 1906. These figures were made public at the fifty-second annual meeting of the National Board of Fire Underwriters at the Hotel Astor. R. M. Bissell, president of the Hartford Fire Insurance Company, and president of the National Board, presided at the meeting, which was attended by 137 prominent fire underwriters from all sections of the country.

Otho E. Lane, chairman of the board's committee on statistics and origin of fires, declared that the per capita loss rose from $2.10 in 1916 to $2.42 in 1917. Owing to unsettled conditions no attempt was made in 1917 to secure statistics showing fire losses in European cities.

Contrary to the general impression enemy aliens had little or no part in the losses by fire since the United States entered the war. On this point president Bissell, in his annual report, said: "As soon as the war began it was realized that the danger of fires caused by enemy incendiaries was not to be ignored, and, as was perhaps natural, many sensational rumors gained currency, among them one which mistakenly quoted the National Board of Fire Underwriters as authority for the statement that property to the value of $43,000,000 had been destroyed by fires caused by enemy aliens during the first nine months of the war. This published statement had the careful attention of our actuarial bureau, and disclosed the fact that as to nearly 95 per cent. of the fires cited there was no proof of incendiary origin, and as to nearly 90 per cent. no reason even for suspicion of such origin. This does not indicate the absence of danger from hostile alien incendiaries, but shows that their success thus far has been by no means as great as was to be expected."

The board's executive expressed the belief that the increase in fire losses was due to war conditions, which had called for the speeding up of industries, the hasty construction of new factories, congestion and overtime.

The election of officers resulted as follows: President, Frederick C. Buswell, Home Insurance Company; vice-president, Charles L. Case, London Assurance Company; treasurer, Charles J. Holman, Commercial Union Company, and secretary, George G. Bulkley, Springfield Fire & Marine Company; executive committee: C. G. Smith, Henry E. Rees, P. L. Hoadley, Frank Lock, Lyman Candee, R. D. Harvey, J. B. Levison, W. R. Hodge, A. D. Baker and Edward Meinel.